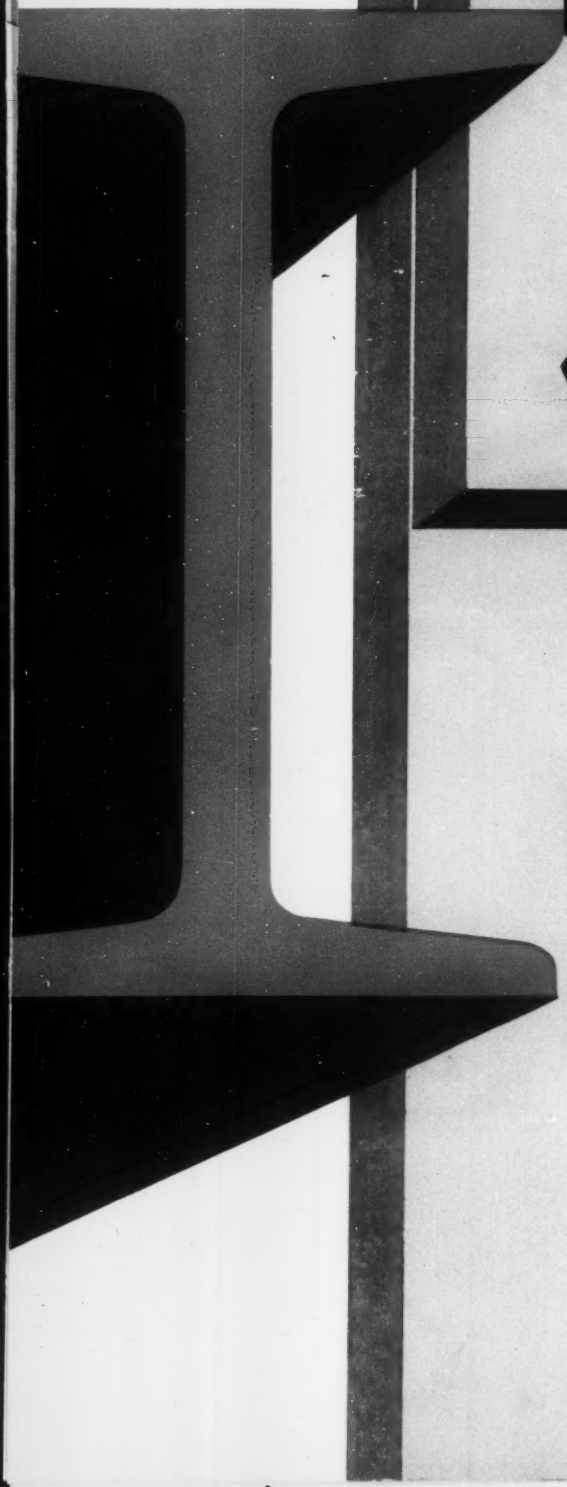
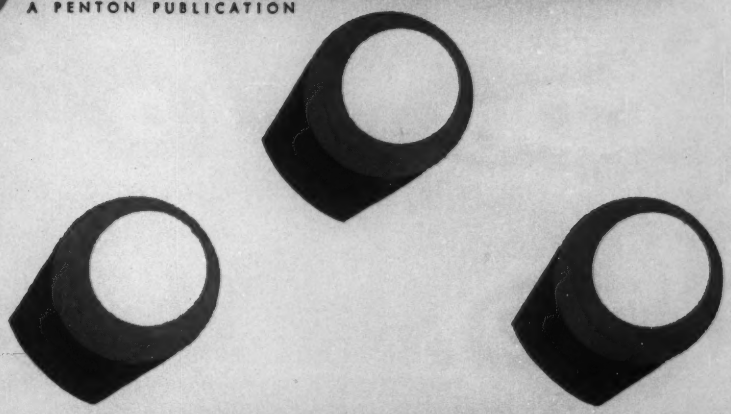
MAY 27, 1957

STEEL
The Metalworking Weekly

A PENTON PUBLICATION





New Look in Steel Market:

Heavy products get a bigger share
—page 143

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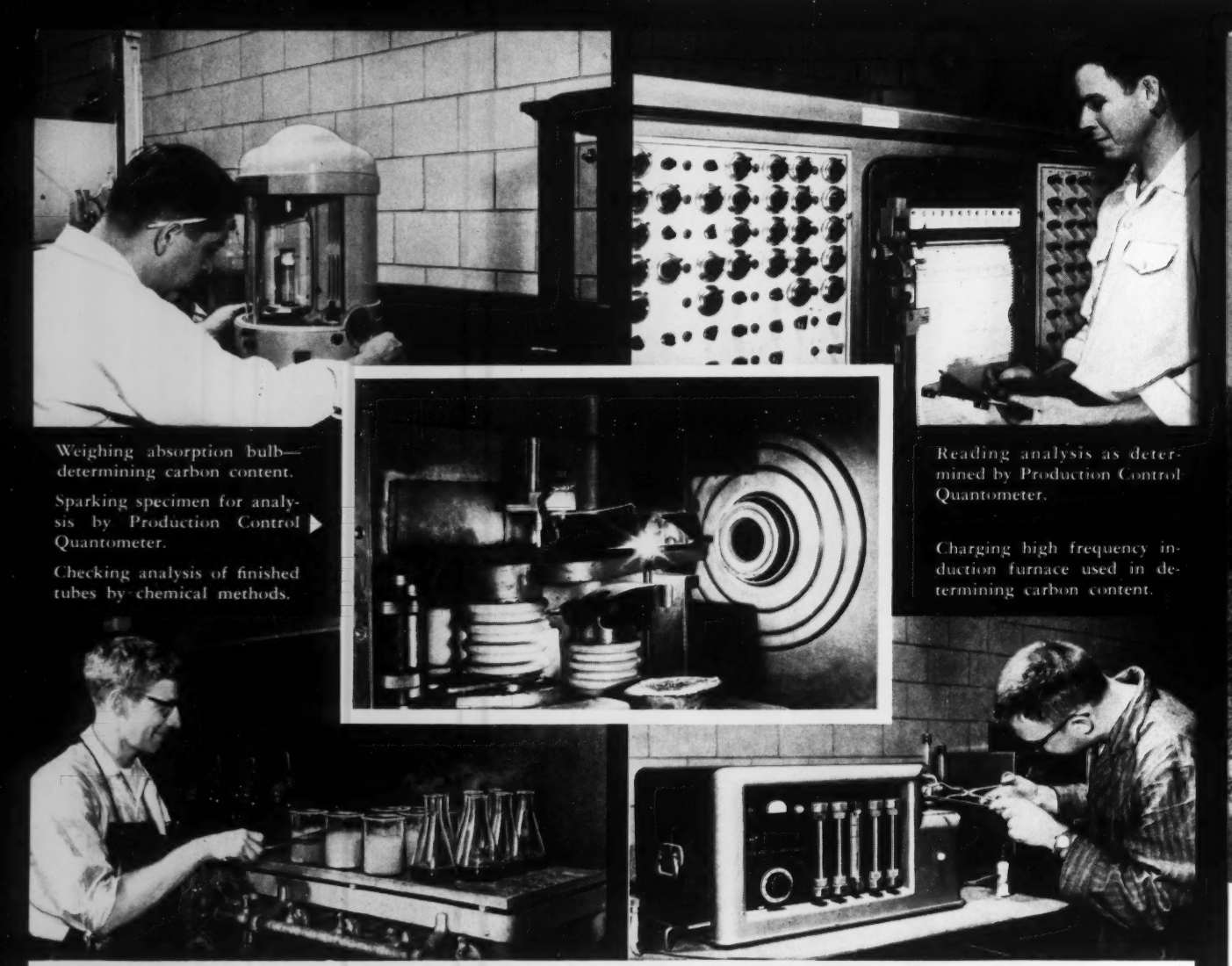

Weighing absorption bulb—determining carbon content.

Sparking specimen for analysis by Production Control Quantometer.

Checking analysis of finished tubes by chemical methods.

Reading analysis as determined by Production Control Quantometer.

Charging high frequency induction furnace used in determining carbon content.

THE O.K. YOU DO NOT SEE IS YOUR GUARANTEE

The key to the physical and mechanical characteristics of any steel lies in its analysis. Tensile strength, corrosion resistance, resistance to "creep" at elevated temperatures, reaction to heat treatment—to name a few—are largely determined by composition.

Through B&W's analytical laboratories pass the tubing destined for practically every known type of pressure or mechanical application—hundreds of different steels—each with its own particular characteristics—and checked by technicians who know their job and using the most advanced laboratory equipment available anywhere.

Modern control methods, plus years of experience help to make the B&W laboratory "O.K." the invisible hallmark of tubing quality—and is your assurance of ease of fabrication and good service. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

TA-7019-G3

Seamless and welded tubular products, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels.

A foursome holes out on the 4th green at Inverness. The bethanized chain-link fence was made and erected by Marleau-Hercules Fence Co., Toledo.

Inverness Club, host for USGA Open, chooses bethanized fence

Top golfers will compete for the coveted USGA Open crown on the scenic and challenging links at the Inverness Club near Toledo, Ohio. Getting ready for the tournament, to be held June 13 to 15, was a big task for the club management.

One of their first steps last fall was to enclose several long stretches of the club boundary. They wanted a fence that would be both attractive and long-lasting — two good reasons for choosing fence made from bethanized wire.

Bethanized wire is used for much of the chain-link fence sold today. Its uniform coating of pure zinc is deposited electrolytically on the steel wire. It goes on atom by atom. There are no thin spots. Long after other types of fence have become unsightly, bethanized fence stays bright because the tightly bonded jacket of zinc just won't crack or flake off.

Fence erectors like bethanized fence because the wires are smooth, with no sharp or rough spots to slash fingers. And at playgrounds and swimming pools there is no danger of torn clothing or injury when people crowd against the fence.

Bethanized wire is ideal for twisted wire brushes, conveyor belts, chain, and many other products that are severely formed. The zinc is highly ductile because in our unique process the zinc deposited is 99.9-pct-pure. We can supply this popular wire in hard or soft temper, with light or heavy zinc coatings. Our nearest sales office will gladly arrange to ship you a trial order.

Fence made from bethanized wire stays strong and bright. Its uniform coating of electrolytic zinc is tightly bonded to the steel for long service.

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BETHLEHEM STEEL

(Advertisement)

HOW THREE PHASE RESISTANCE WELDING IS USED TO FABRICATE STRUCTURAL STEEL

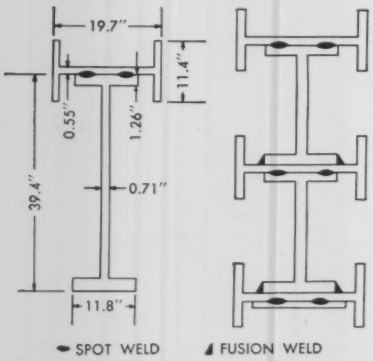
Production proves Sciaky techniques of resistance welding provide the consistently safe welds necessary for assembling primary structures.

For over 20 years resistance welding has been used to fabricate metal structures by many European contractors. However, until recently the process has been restricted to relatively light sections.

Structural Steel Fabrication

In Rouen, France, Enterprises Metropolitaines & Coloniales is now successfully resistance welding heavy structural beams into composite strength members.

Figure 1 shows a typical cross section of two "I" beams spot welded together. Figure 2 shows a more elaborate development of the assembly shown in Figure 1. Five "I" beams are welded into one composite strength member.



SPOT WELD Fig. 1 FUSION WELD Fig. 2

A typical beam is almost 69 feet long. It is part of an assembly 131 feet long weighing 45 tons. A total of 182 spot welds in two rows is used to fabricate the structure.

Sequence of Operations

To facilitate production, beam elements to be welded are mounted on an arrangement of two carriages located in front of the welder. One of the carriages is powered and operated by remote control by the single operator (not skilled) who also triggers the weld sequence. Indexing time is 4 seconds.

The welding of the assembly is accomplished in four operations. Operation No. 1 begins in the middle of the column. One row is made to the end and the welder returns to the middle to weld the balance of the row in the other direction. The second row is accomplished in the same manner.

The average time required for each spot weld including indexing is less than 40 seconds. *The entire beam is fabricated in less than two hours including set-up time.*

The Welder

The welder is a Sciaky Patented Three Phase 450 KVA Welder designed to be operated from a cradle or in a suspended position (as shown in the photograph). Power supply is 220 volts. Maximum electrode force is 14 tons. Maximum secondary current is 75,000 amps. Controls are located directly opposite the welder.

The key to successful welding of heavy structural shapes is the Sciaky Patented Three Phase Principle. In addition to its many other advantages it provides the weld quality and consistency essential to primary structure fabrication.

Advantages of Resistance Welding

The use of Sciaky Resistance Welding Techniques results in a substantial saving in material and weight.

It eliminates extra beam size necessary to compensate for the weakening effect of rivet holes. The extra operation and time necessary to drill rivet holes is eliminated. In addition the material and weight contained in rivet heads is eliminated.

Only one worker (not skilled) is needed for the welding operation.

Further Information

More detailed information on this operation is presented in a twelve page illustrated report. Write for your copy, asking for the *"Resistance Welding at Work Special Report on Fabricating Structural Steel."* There is no obligation.

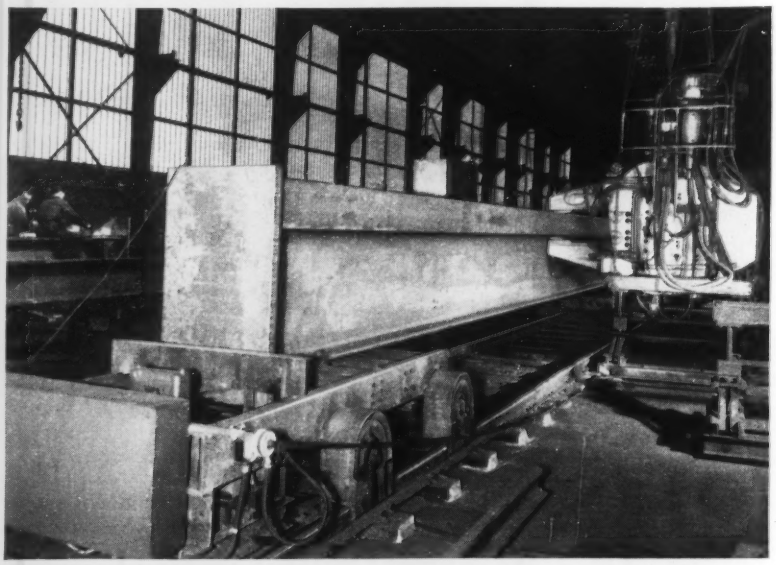


Fig. 3 View of beam riding on powered dolly as welds are being made by the Sciaky Patented Three Phase Welder.

Largest Manufacturers of Resistance Welding Machines in the World

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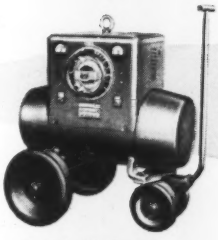
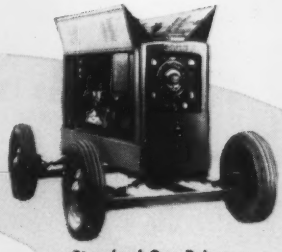
...the new modern HOBART WELDERS

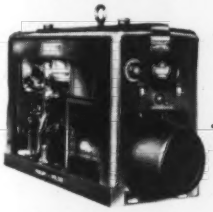


Electric Motor Drive
200 to 600 Amp.

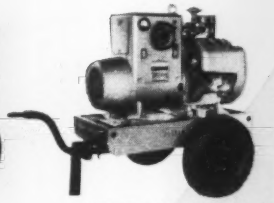
DC Rectifier
200 or 300 Amp.



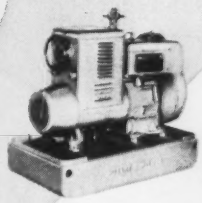
Standard Gas Drive
300 to 600 Amp.



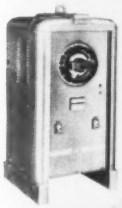
Contractors Special
250 Amp.



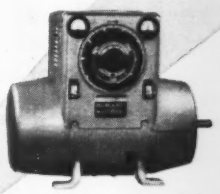
AC Welder/AC Power Combination



"Husky Boy"
200 Amp. air cooled



AC Transformer
180 to 500 Amp.



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- ☐ AC/DC Welder
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The Green Seal signifies true dimensional stability. It means that now when you reach for a matched set of V-belts, you can be sure they're matched -- no matter how long they've lain on the shelf. And that means longer life and a minimum of down time.

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THE GREATEST NAME IN RUBBER

Green Seal—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

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The Metalworking Weekly

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Walsh Points the Way... TOWARD A NEW HORIZON in REFRACTORY Performance

AN OPEN LETTER TO THE STEEL INDUSTRY

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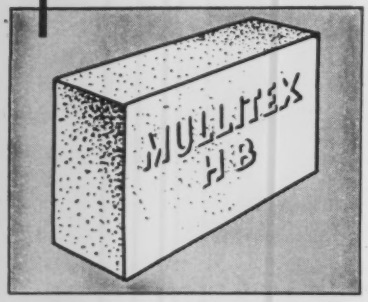

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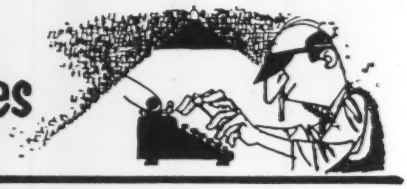
behind the scenes



Noting a Trend

How would you like to skin the Statue of Liberty? That beautiful lady wears a hide 3/32-in. thick, and it's solid copper. This hide weighs 200,000 lb. At today's prices, it would easily fetch $6400. Would you like to know something else about her? Well, her index finger is 8 ft long, and her mouth is 3 ft wide; she cost over $500,000, was in production for 12 years and was installed in October, 1886. During the unveiling ceremonies, we happened to be part of an honor guard. The old uniform with the faded sergeant's chevrons we had won at Chickamauga was pretty tight, but that same condition helped hold us at attention.

"Lucky thing for us that statue ain't solid," one of the workers remarked. "She weighs 450,000 lb; if she had been one solid hunk, somairdnet oresorg oturb euq!" The worker had been raised by Algonquins and frequently reverted to dialect.

True, the connection may not be too clear, but STEEL's cover story this week stirred up the foregoing reflections, when Associate Managing Editor Vance Bell and Associate Editor Robert Jaynes waylaid us in great excitement.

"There's an obvious change in steel product mix!" exclaimed Jaynes, expanding his eyelids to a healthy *f*.2 on bulb. "The proportion of steel going into the heavier forms of steel has been rising over the last year!"

"This is in definite contrast to a quarter century trend," interrupted Bell.

"Steel facilities were geared to the production of lighter shapes and forms," shouted Jaynes, trying to cut in ahead of the fast talking Bell. "It was thought they couldn't switch easily—but, by George, they certainly have. Vance here will tell you that years ago we used to make everything solid: A bar in place of a tube; a plate instead of a sheet . . ."

"Then everything was made lighter," cried Vance. "Tubes for bars, sheets for plate and like that. Now we're getting heavier forms of steel again. Our story will explore the recent changes in product mixes and prospects for the future."

"Can you think of anything," Jaynes inquired, "that might illustrate this trend?"

The first thing that popped into mind was the fact that the Statue of Liberty was hollow; that if it had been solid, a workman with an Algonquin accent would have been dismayed, but we have a sneaking feeling that this bit of intelligence will do nothing at all for the story—so you better read it yourself. It's on page 143.

The Urge To Know

Editor-in-Chief Irwin Such sometimes gets to wondering about the number of talks STEEL editors make during the course of a year, the number of calls they make, number of miles they travel, the number of telephone calls that come into the office. He wonders about the number of meetings the editors attend and how many parties. When he got to the point where he couldn't sleep unless he knew the answers, he sent a questionnaire around to his editors, and now, judging by the relaxed appearance of the man, it is evident that he sleeps soundly every night. His findings, of course, are company property, and we have neither the intention nor the inclination of revealing top-secret stuff. However, he was kind enough to let us know that STEEL editors traveled well over half a million miles in 1956 on behalf of the nation's foremost metalworking weekly.

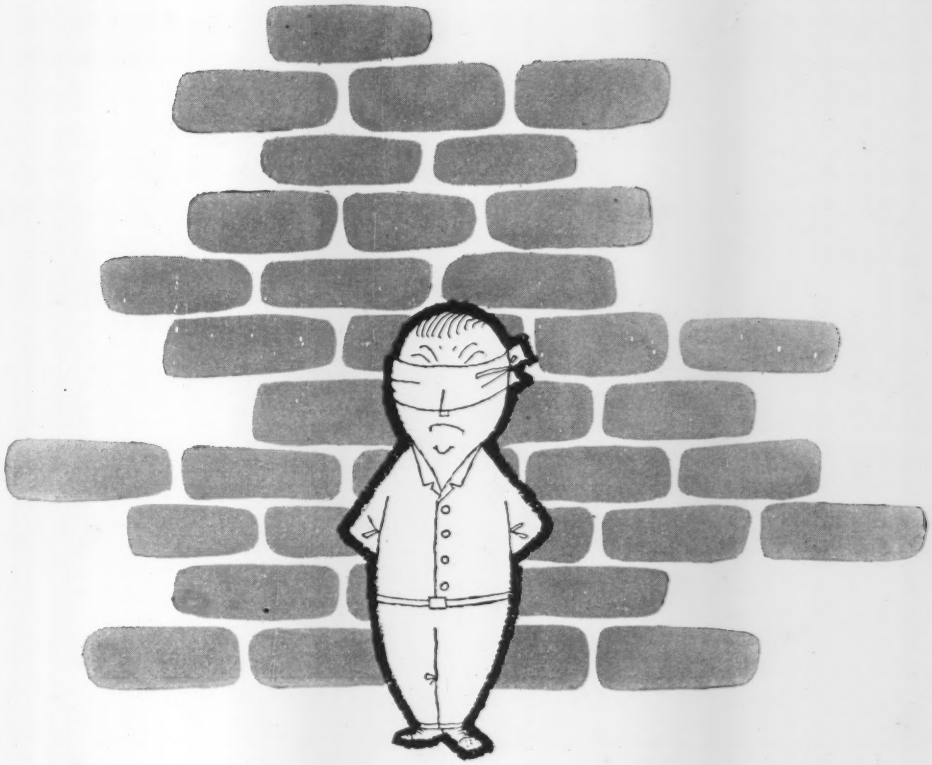
Think of all that hustling and bustling to keep the magazine busting with news, features, engineering and market stories every week! We're going to keep a secret copy of Irwin's questionnaire and extract startling items from it from time to time.

A Lamiced Problem

We have to bow to the sixth graders ever so often. If you made a business transaction with the Noelomis in Acirema, what would a semid net gain amount to?

Shrdlu

(Metalworking Outlook—p. 47)



WHO TAKES THE RAP?

When you place an order for metal stamped parts, any number of things can go wrong. Probably no one knows this better than you. When deliveries are late or quality misses the mark, who pays the *real* penalty? You do! Don't you?

Sure, you can reject the job and insist that defective parts be corrected or replaced. But who *absorbs* the costs of delays and inconveniences? *Isn't it you?*

Or, if you are forced to let inferior stampings slip through, because production schedules are pushing you, who takes the rap then? The stamping plant has only one displeased customer . . . that's you! But, how many will you have?

Why take such chances? You don't have to with Crosby. Take quality, for example. It's maintained at the highest standard at all times. Crosby quotations are made on that basis. Prices which are fair to customers and fair to Crosby assure top-grade production. Deliveries are made as scheduled. Promises made are promises kept.

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Stereo pictures are easy...for the people who take them. Simple adjustments, the snap of a shutter control...and a moment of life is permanently recorded in natural color and three-dimensions!

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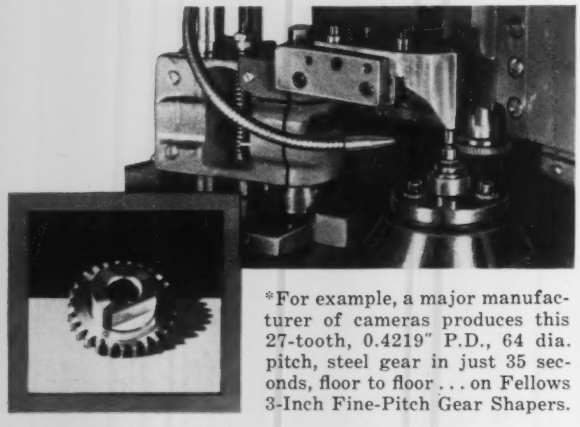
Cutting gears that meet the requirements for these cameras is a job for Fellows machines. In many plants manufacturing still and motion picture cameras and projectors, standard Fellows Fine-Pitch Gear Shapers combine the necessary precision with low cost and high production rates, not only on gears but on non-involute parts.*

To combine accuracy with high production rates, look to the complete Precision Line of Fellows gear production equipment. Fellows Gear Shapers are available in a full range of capacities from 1/16" to 120" P.D. Write, wire, or phone any Fellows office.



*For example, a major manufacturer of cameras produces this 27-tooth, 0.4219" P.D., 64 dia. pitch, steel gear in just 35 seconds, floor to floor . . . on Fellows 3-Inch Fine-Pitch Gear Shapers.

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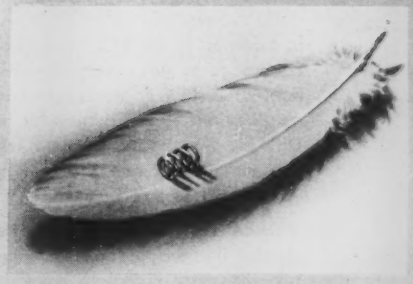

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In addition to DETREX 37, DETREX manufactures a metal cleaning compound to meet *every* requirement in this field. Without obligation, a DETREX representative will analyze your specific cleaning application. Drawing from his experience and the wide range of DETREX water-soluble metal cleaning compounds, he can then recommend the one that will guarantee maximum efficiency in your metal cleaning operation.

DETREX service continues beyond the initial sale with regular checks on product performance and efficiency. Only DETREX provides such complete coverage—from recommendation of the proper method through installation to periodic counsel and service.

This "One-Source" efficiency has made DETREX, pioneer in the metal cleaning and processing field, the recognized leader. Let us show you how DETREX can recommend and service the most efficient methods, materials and machines to meet your requirements. Write today for information on increasing efficiency at lower cost.

DETREX CHEMICAL INDUSTRIES, INC.
BOX 501-A, DETROIT 32, MICHIGAN

LETTERS TO THE EDITORS

Readers Like Apr. 22 Issue

Your issue of Apr. 22 is outstanding. Congratulations. I would like copies of each of these articles: "Titanium Fabrication from A to Z" (page 94) and "How To Choose Heat Tolerant Coatings" (page 82).

D. C. Goldberg
Manager
Metallurgy Division
Aviation Gas Turbine Division
Westinghouse Electric Corp.
Kansas City, Mo.

As usual, I have enjoyed reading my latest STEEL, the issue of Apr. 22. The article, "What Makes a Good Deep Drawing Steel?" (page 78), was particularly interesting to me, and it is good reference material. Please send an extra copy.

B. R. Wilson
Chief Products Engineer
Oil Equipment Division
Butler Mfg. Co.
Kansas City, Mo.

One Way To Cut Costs

The article, "Ways To Cut Waste" (Apr. 29, page 208), is of special interest to those engaged in the materials conservation program of the U.S. Army Corps of Engineers.

Its publication is encouraging, since it will reach a large portion of the people who have conservation responsibilities, those in the metalworking industry. The Conservation Check List should prove valuable to all designers and engineers having product responsibility.

Our conservation program would be aided considerably if we could receive permission to reproduce this article for distribution to laboratories and procurement offices within the Corps of Engineers.

W. H. Kindle
Assistant, Procurement Division
Military Supply
Office of the Chief of Engineers
Department of the Army
Washington 25, D.C.

• *Permission granted.*

Trade Association Appreciative

Your publication should be commended by association executives for the article, "Use Your Trade Association" (Mar. 25, page 61).

It is significant and appropriate. Coming from an unsolicited source, it is much more effective than if we said the same thing to our members. We believe that it is especially effective due to the fine reputation of STEEL.

If possible, we would like to reproduce this article and send it to our

(Please turn to page 12)

...lets one man handle work you'd pay a crew to do!

By putting new efficiency, safety and positive control into the hands of Towmotor lift truck operators you enable them to do a *bigger day's work, easier.* You let each one handle jobs you'd normally hire a *gang* to do.

Through modern Towmotor mass-handling each operator has the power to improve your profit picture, because the new Towmotor fork lift trucks multiply their productivity. Look over the new features that operators like best about our latest models—such as:

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- Off-center adjustable seating
- Double action hydraulic tilt
- Newly-improved power steering
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- Famed 12" reach for all controls

Before you decide on your next fork lift truck, we urge you to get all the facts on the newly-designed Towmotor units. Write to Towmotor Corporation, Cleveland 10, Ohio today and ask for our new illustrated lift truck booklet—No. SP-23.

Leaders for 38 years in building Fork Lift Trucks, Tractors and Carriers

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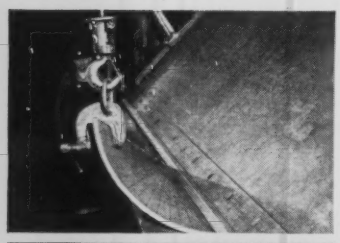
Gerlinger Carrier Company, Dallas, Oregon, is a subsidiary of Towmotor Corporation

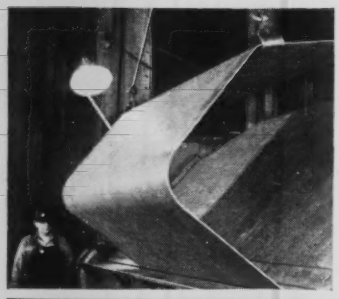
Bending Steel Plates for WELDMENTS?

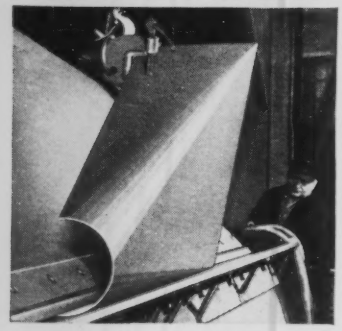
do it economically with

CHICAGO® POWER BENDING BRAKE

(no dies needed)





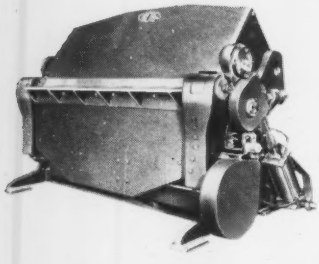


The accompanying illustrations give an idea of the versatility of the CHICAGO bending brake. No dies have to be changed or adjusted—no dies are used on these jobs. Yet, duplication is easily obtained on successive pieces. The machine is quickly adjustable for different thicknesses of material up to rated capacity. Automatic stop regulates the angle of bend. This, too, is adjustable to any degree of bend. The ease of changing from one job to another and the elimination of die costs make the CHICAGO bending brake the economical method for bending steel plates for weldments.

Many standard sizes are available with capacities for bending mild steel up to 12 feet by ¾ inch or 16 feet by ½ inch. Also many standard sizes in hand and power operated models for sheet metal.

BULLETIN P-55
This bulletin gives the details of how these and many other jobs are handled. Also complete description of the machine and specifications of the standard sizes.
Ask for a copy.

Front view of one of the heavy duty models of CHICAGO power bending brake showing the operation end of the machine.



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Press Brakes • Straight-Side Presses • Press Brake Dies

Hand and Power Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.

7458 South Loomis Boulevard, Chicago 36, Illinois

LETTERS

(Concluded from page 10)

members together with our regularly issued *Cutting Tool Briefs.*

We also intend to pinpoint the article to our officers and directors at our next board meeting.

Martin J. Ewald
Executive Secretary
Cutting Tool Manufacturers Association
Detroit

• *Permission granted.*

Lauds Profit Sharing Story

Your article, "Profit Sharing" (Apr. 15, page 115), does a fine job of giving an over-all review of the field without getting too wrapped up in detail. The separate boxes with illustrations highlighting the main points do a fine job of summarizing.

I am sure your article will draw attention to the field of profit sharing on the part of people who have not been aware of it.

Roger H. Cushman
Assistant to Chairman
Signode Steel Strapping Co.
Chicago

Makers of Helicopters

In the Apr. 1 issue, there appears a story on helicopters, "Helicopter Orders Soar" (page 59). We would appreciate a list of the 12 manufacturers mentioned.

J. W. Barnard Jr.
Advertising Department
Ohio Seamless Tube Division
of Copperweld Steel Co.
Shelby, O.

• *A list is being forwarded. For further information about helicopter manufacturers, write: Don R. Mockler, director and public relations manager, Helicopter Council, Aircraft Industries Association of America Inc., Washington, D.C.*

Enjoys Reading Bearing Story

I enjoyed reading the article, "Bearings for Tough Jobs" (Apr. 8, page 114). I would appreciate a copy.

W. A. Rissman
Manufacturers' Agent
Denver

Query on Sales Information

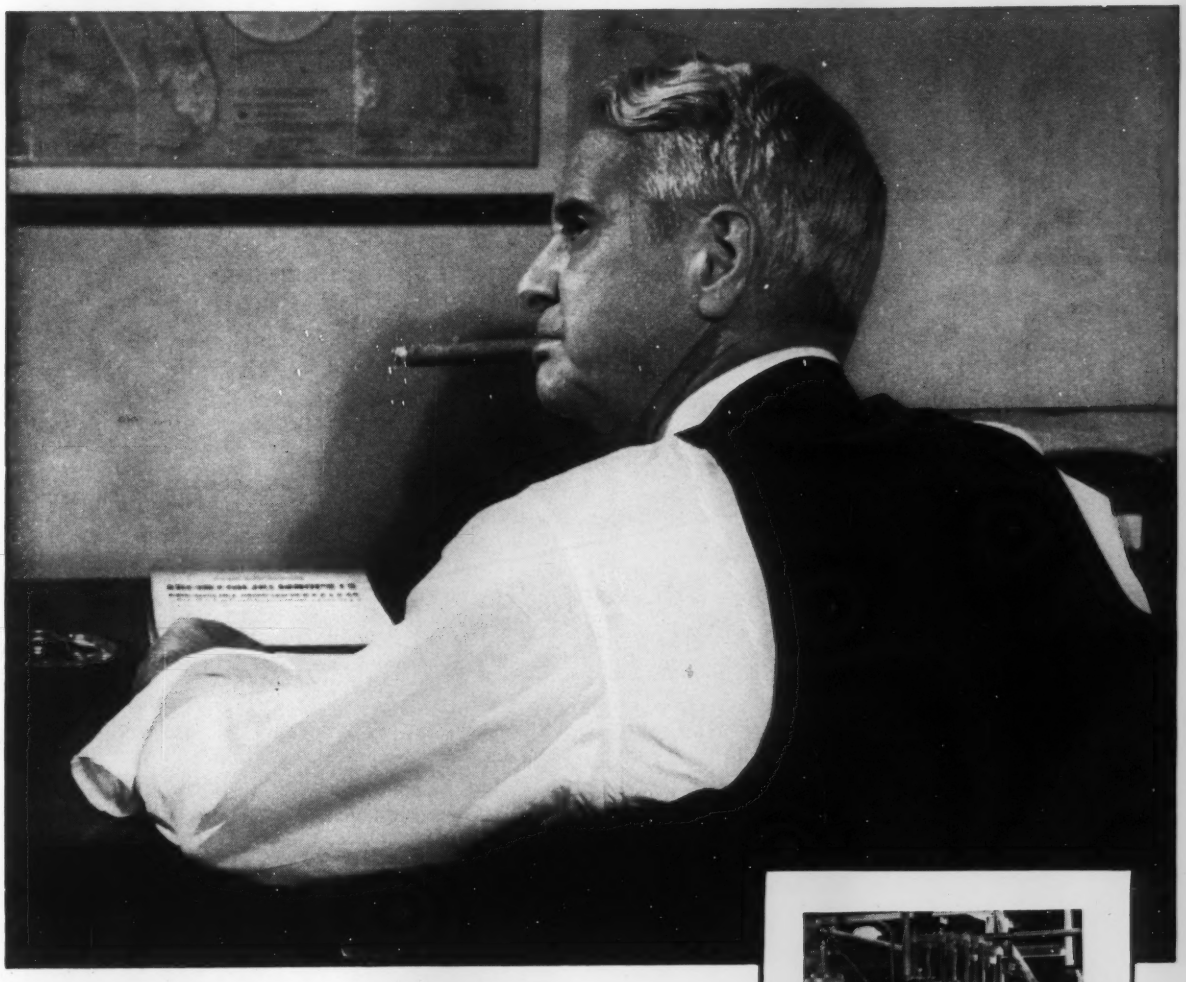
Industrial pump shipments for the last ten years were shown as a part of the article, "Pump Shipments Soar" (Apr. 22, page 48).

I would appreciate knowing the source of this sales information and whether the 1957 estimates were made by your publication or gathered from outside sources.

J. E. Burns
Market Analyst
Webster Electric Co.
Racine, Wis.

• *Primary sources were the Census Bureau, Department of Commerce and a* STEEL *survey of pump manufacturers producing the types used.*

Final estimates were made by STEEL, *based on analysis of the data gathered from the above sources. Final statistics in the 1954 census were used as a base. The following years were projected from sales reports made by manufacturers and several large users, notably in the chemical and oil industries.*



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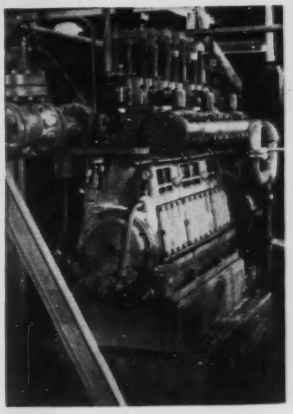
The very simplicity of the Aldrich Direct Flow design means horizontal straight line flow from suction to discharge. Reduced space between valves results in higher volumetric efficiency. Fluid-end sectionalization for fast, easy maintenance; changeable plunger sizes; and interchangeability of parts are additional reasons why Aldrich Pumps have earned a reputation for dependable, low cost performance on applications such as die casting, hydraulic press operation, roll balancing, descaling and hydraulic testing.

For your tough pumping problems, it pays to specify Aldrich. Write today for a copy of Data Sheet 100, a condensed catalog and selection chart covering our entire line. The Aldrich Pump Company, 18 Pine Street, Allentown, Pa.

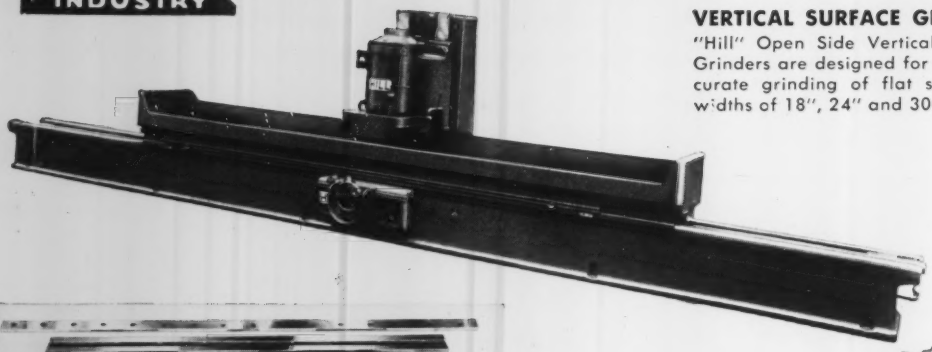


Four 5" stroke Aldrich Direct Flow Pumps on die casting service in a midwestern metalworking plant. These pumps are handling 250 gpm at 1500 psi.

THE ALDRICH PUMP COMPANY

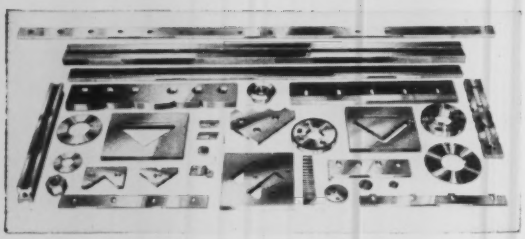
HILL ACME

HILL ACME TOOLS FOR INDUSTRY



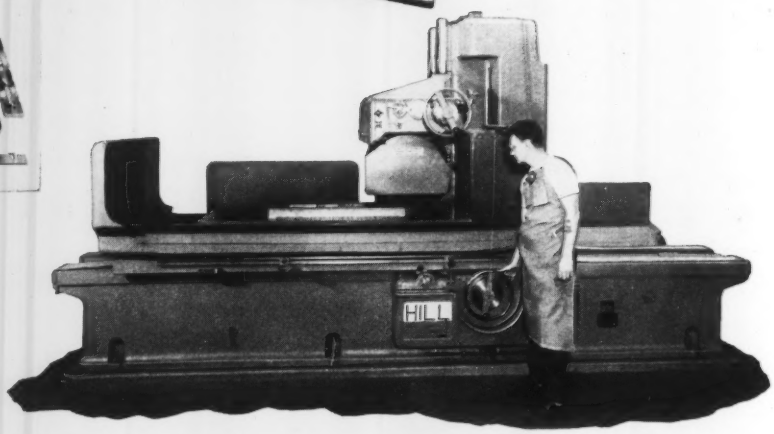
VERTICAL SURFACE GRINDERS

"Hill" Open Side Vertical Spindle Hydraulic Surface Grinders are designed for rapid stock removal and accurate grinding of flat surfaces. Furnished in table widths of 18", 24" and 30"; table lengths 60" to 240".



SHEAR KNIVES

"CLEVELAND" Knives and Shear Blades. Solid and laid steel shear blades; rotary slitting and side trimming knives; metal cutting machine knives.



HORIZONTAL SURFACE GRINDERS

"Hill" Open Side Horizontal Spindle Hydraulic Surface Grinders for accurate grinding of flats, angles, irregular and special shaped surfaces. Furnished in table widths from 18" up to 36"; table lengths 60" to 240".

ABRASIVE BELT GRINDING & POLISHING MACHINE

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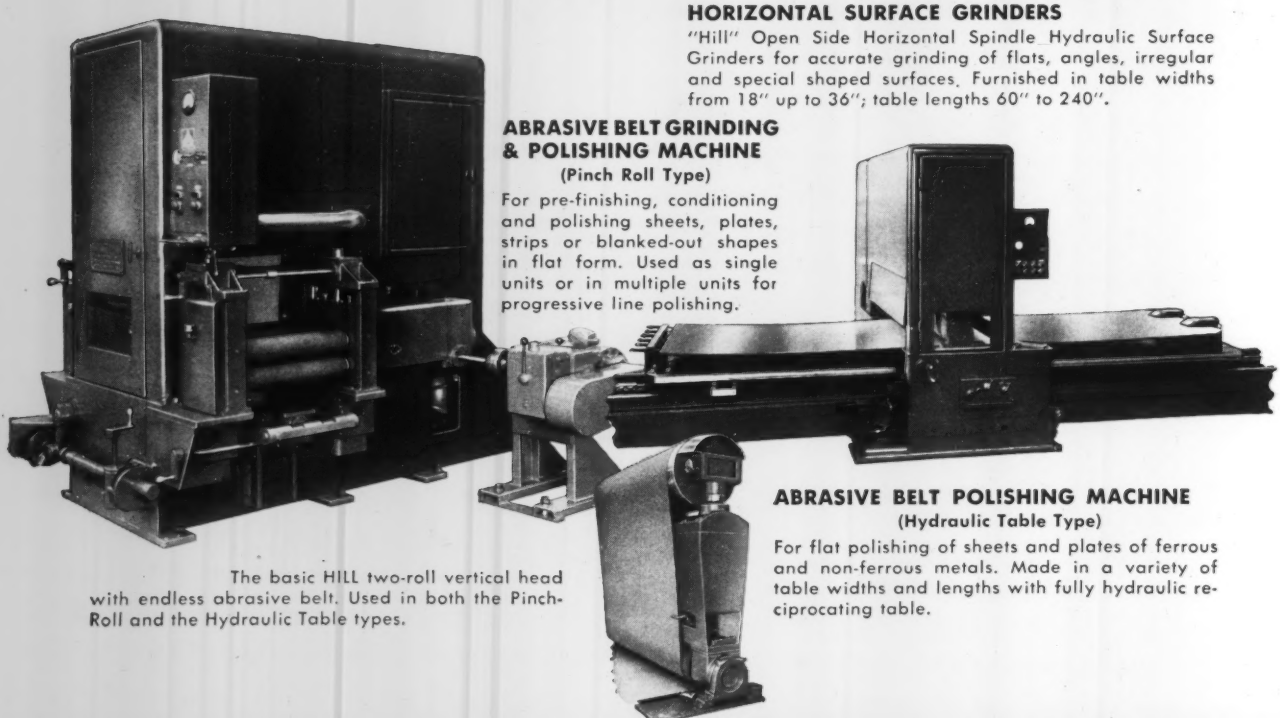
For pre-finishing, conditioning and polishing sheets, plates, strips or blanked-out shapes in flat form. Used as single units or in multiple units for progressive line polishing.



The basic HILL two-roll vertical head with endless abrasive belt. Used in both the Pinch-Roll and the Hydraulic Table types.

ABRASIVE BELT POLISHING MACHINE

(Hydraulic Table Type)

For flat polishing of sheets and plates of ferrous and non-ferrous metals. Made in a variety of table widths and lengths with fully hydraulic reciprocating table.

Tools for Industry

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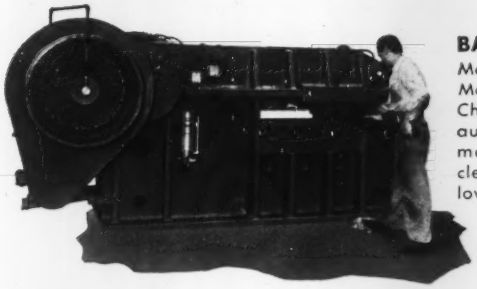

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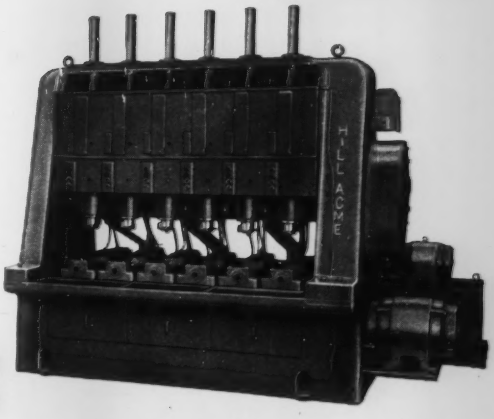
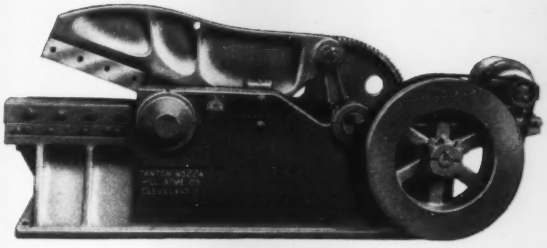
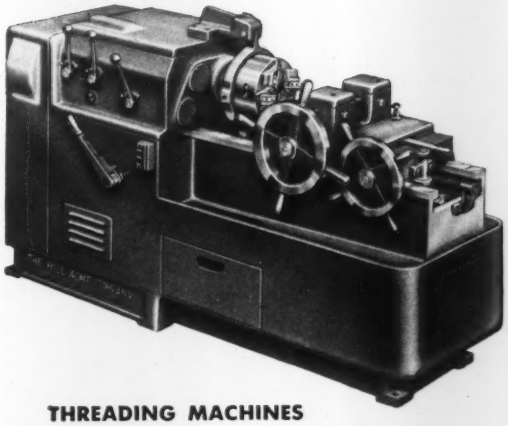


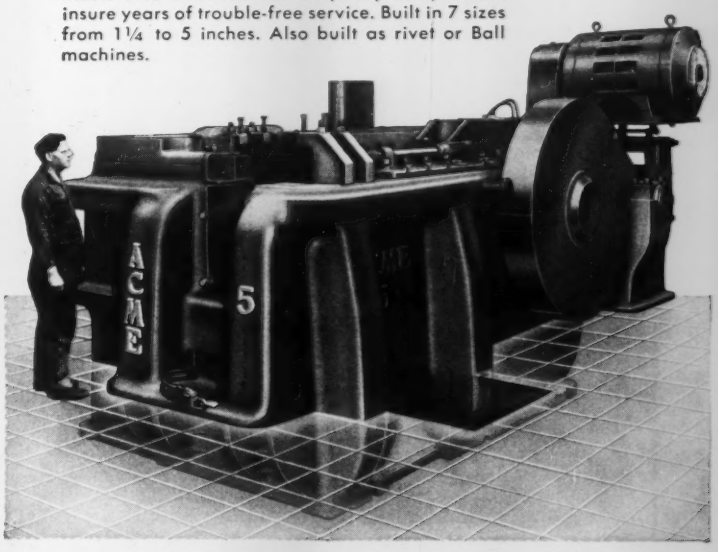
ALLIGATOR SHEARS
"CANTON" Alligator Shears are the most rugged, powerful and trouble free shears ever built for processing scrap. Modern design has produced a stronger shear, with fewer parts, and positive lubrication. Made in a full range of sizes to meet every condition.



TAPPING MACHINES
"ACME" model XC-W six spindle Coupling Tapper. Built in 1" capacity and larger, in 6 or 8 spindle. Can be adapted as a nut tapper.

FORGING MACHINES
"ACME" XN Forging Machines produce accurate, quality forgings for long uninterrupted periods. Massive construction and simplicity of operation insure years of trouble-free service. Built in 7 sizes from 1¼ to 5 inches. Also built as rivet or Ball machines.





THREADING MACHINES
"ACME" HA Single and Double Spindle Threading Machines are equipped with tangent or hob type die head which assures economical, accurate, high speed production. Furnished in sizes from 1" to 2½" capacity.

THE HILL ACME COMPANY

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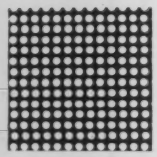

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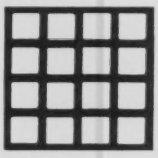

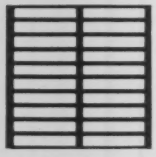

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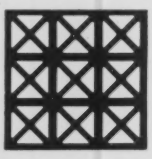

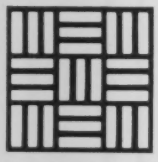

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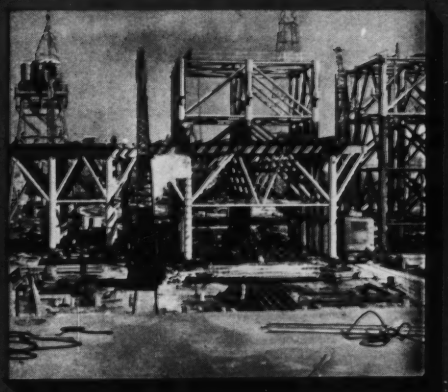

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of Safety Door-Latch Design

There is no room for error in safety engineering. Not even in the smallest detail. That's why Ford Engineers use Republic Nylok Bolts to anchor striker plate to door post.

Nylok Bolts permit precise positioning of striker plate to safety latch during assembly. When torqued tight they provide a positive, vibration-proof clamping action to keep the plate locked in place. Holding-power of latch assembly is permanently maintained.

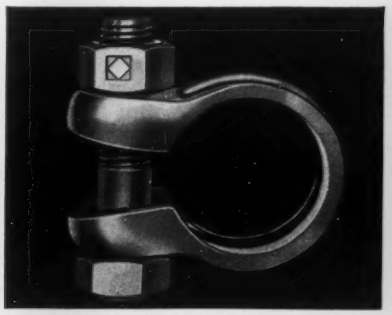
Republic Nylok Bolts have proved ideal for a wide variety of bolted assemblies subject to impact or vibration. Their relentless grip is produced through compression of a small nylon pellet imbedded in the bolt body when unit is wrenched into threaded hole. In attempting to regain its original shape, the pellet exerts a continuous, powerful lateral thrust, forcing a strong metal-to-metal lock between opposite mating threads. Lock is positive, whether or not bolt is seated. Further, this resiliency of nylon provides excellent adjustment and re-usability characteristics, and permits relatively soft materials to be locked to threaded members without damage.

In addition to design advantages, use of Republic Nylok Bolts offers many production savings. They can be hand or power wrenched with equal effectiveness. There is no galling of threads or seating surfaces. Expense of assembling extra locking devices or wiring is eliminated.

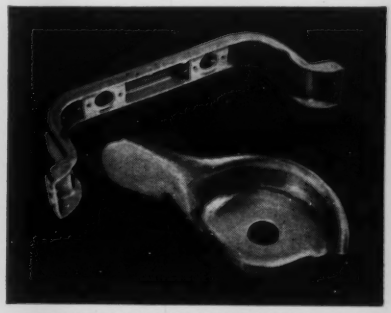
Finally, you get all the advantages of Nylok locking plus top fastener quality when you specify Republic Nylok Bolts. Complete manufacturing control from ore to finished product is your assurance of consistent peak performance.

For full information, contact your nearest Republic office. Or mail coupon.

DEPENDABLE PERFORMANCE is built into Republic Chain Slings by careful control of every manufacturing step from raw ore to finished product. Available in single, double, triple, and quadruple types—in carbon and alloy steels and wrought iron. All assemblies, including matched accessories, are proof-tested before shipment. For illustrated Chain Sling Catalog, ADV-719, mail coupon.



REPUBLIC NYLOK NUTS provide safe, simple, strong locking action, using the same nylon pellet principle as Nylok Bolts. They are ideal for automatic feeding because they assemble from either end. A vibration-proof lock is obtained wherever hand or power wrenching stops. Easy adjustment and re-use are assured by permanent resilience of pellet.



POSITIVE MANUFACTURING CONTROL assures quality in components or products, produced to your specifications by Republic's Pressed Steel Division. Facilities include presses capable of forming every gage stamping, up to the heaviest. Also, welding, brazing, riveting, machining, annealing, galvanizing, and painting operations are available. For information on extending your production capacity with Republic Contract Facilities, mail coupon.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
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Please send me more information on:
☐ Nylok Fasteners. ☐ Contract Facilities.
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Take it from the early birds...

"IT'S THE GREATEST

Niagara Series E 4½ OBI Press in operation at a well known eastern commercial stamping plant. Work includes stamping small wrenches; trimming canopies for electrical fixtures; piercing, cutting off and forming saddles with a progressive die (shown).

Niagara Series E 4½ OBI Press engaged in blanking and drawing of kitchen cannister lids from half-hard aluminum at midwestern housewares manufacturing plant.

"we can produce from 8,000 to 10,000 pieces in an eight hour day"

"much safer press"

"takes less floor space"

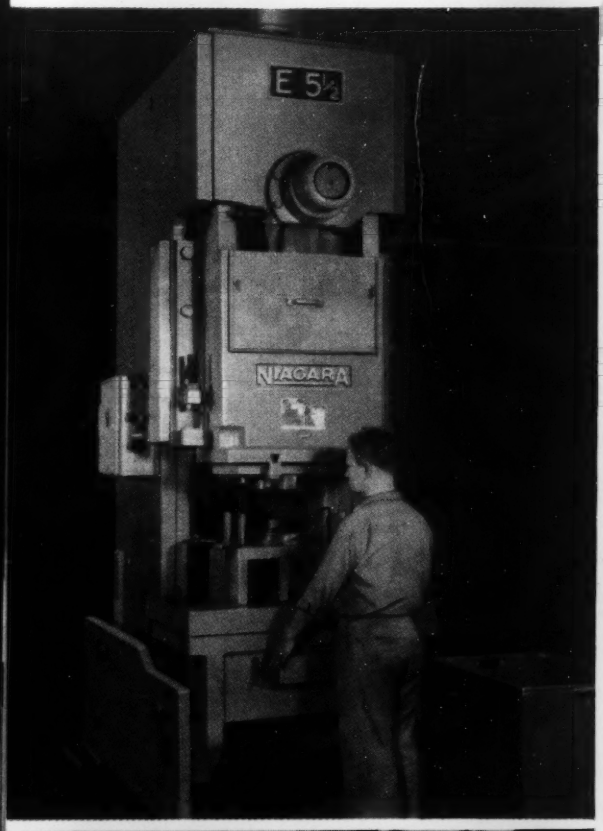
"has a centralized pressure lubricator which we like very much"

O.B.I. EVER BUILT"

"we find that dies without posts work much better on this press"

"all dies give better and longer runs"

"large slide area for large trimming, blanking and progressive dies"



Niagara Series E 5½ OBI Press forming and trimming hemispherical copper parts for one of the "Big Two" electrical manufacturers.

Few developments in metalworking history have drawn the enthusiastic endorsement given Niagara's revolutionary Front-to-Back Crankshaft OBI Press.

Now, as at the 1955 Machine Tool Show where it was unveiled, there is *nothing* even remotely resembling it in the industry... design-wise and production-wise.

Customers in U.S. and Canada... the "early birds" who are doing their modernizing with the most modern press of all... can today tell you about accomplishments with this newest and greatest of OBIs that you would have never dreamed possible. Yes, the press that Niagara conceived to do more than any OBI ever built is doing just that for a fast-growing list of metalworking plants.

There's a huge fund of successful experiences that a Niagara representative can share with you today. Draw on it now and utilize it in your modernization plans. Make a date, at your convenience, for a personal call.

...and if you haven't received new Bulletin 56 with complete design description and specifications (75-200 ton capacities, 4½-7½ inch shaft diameters, standard and automated models) write for your copy at once. You will find it invaluable to your planning.

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America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

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structurally homogeneous

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Sold Everywhere Through Leading Industrial Distributors — Factory: Clifton, New Jersey • Warehouses: Chicago, Illinois; Los Angeles, California

PARKER-KALON® fasteners

CALENDAR
OF MEETINGS

June 2-7, Society of Automotive Engineers: Summer meeting, Chalfonte-Haddon Hall, Atlantic City, N.J. Society's address: 485 Lexington Ave., New York 17, N.Y. Secretary: John A. C. Warner.

June 2-5, American Gear Manufacturers Association: Annual meeting, Homestead, Hot Springs, Va. Association's address: One Thomas Circle, Washington 5, D.C. Executive secretary: John C. Sears.

June 2-6, Air Pollution Control Association: Annual meeting and exhibit, Jefferson hotel, St. Louis. Association's address: 4400 Fifth Ave., Pittsburgh 13, Pa. Executive secretary: Harry C. Ballman.

June 3-5, American Management Association: General management conference, Hotel Statler, New York. Association's address: 1515 Broadway, New York 17, N.Y. Secretary: Andrew P. Donovan.

June 3-7, American Society of Civil Engineers: National spring convention, Hotel Statler, Buffalo. Society's address: 33 W. 39th St., New York 18, N.Y. Executive secretary: William H. Wisely.

June 4-7, National District Heating Association: Annual meeting, Homestead, Hot Springs, Va. Association's address: 827 N. Euclid Ave., Pittsburgh 6, Pa. Secretary-treasurer: John F. Collins Jr.

June 9-12, National Industrial Advertisers Association: Annual meeting, Waldorf-Astoria hotel, New York. Association's address: 271 Madison Ave., New York 16, N.Y. President: John C. Freeman.

June 9-12, National Metal Trades Association: Western plant management conference, Dell View hotel, Lake Delton, Wis. Association's address: 337 W. Madison St., Chicago 6, Ill. Secretary: Charles L. Blatchford.

June 9-13, American Society of Mechanical Engineers: Semiannual meeting, Sheraton-Palace hotel, San Francisco. Society's address: 29 W. 39th St., New York 18, N.Y. Secretary: C. E. Davies.

June 10-11, Magnesium Association: Summer meeting, Homestead, Hot Springs, Va. Association's address: 122 E. 42nd St., New York 17, N.Y. Executive secretary: Jerry Singleton.

June 11-13, Western Plant Maintenance & Engineering Show: Civic Auditorium, San Francisco. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

June 13-14, Malleable Founders' Society: Annual meeting, Broadmoor hotel, Colorado Springs, Colo. Society's address: 1800 Union Commerce Bldg., Cleveland 14, O. Executive vice president: Lowell D. Ryan.

June 14, Pressed Metal Institute: National sales conference for metal stampers, Carter hotel, Cleveland. Institute's address: 3673 Lee Rd., Cleveland 20, O. Managing director: H. A. Daschner.

June 14-16, Steel Kitchen Cabinet Manufacturers Association: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: 1008 Engineers Bldg., Cleveland 13, O. Executive secretary: Arthur J. Tuscany Jr.

June 16-17, National Association of Metal Finishers: Annual meeting, Sheraton-Mt. Royal hotel, Montreal, Que. Association's address: 60 Bently Rd., Cedar Grove, N.J. Secretary: P. Peter Kovatis.

June 16-20, American Electroplaters Society: Annual meeting, Sheraton-Mt. Royal hotel, Montreal, Que. Society's address: 445 Broad St., Newark 2, N. J. Secretary: John P. Nichols.

On which of these can you use help?	OK here	Can use help
PRODUCT DESIGN & DEVELOPMENT		
MANUFACTURING COST ANALYSIS		
PRODUCTION PROCESSING		
TOOL & DIE DESIGN		
MACHINE DESIGN		
TIME STUDIES AND ANALYSIS		
AUTOMATION DEVELOPMENT		
PLANT LAYOUT & SPECIFICATIONS		
PRODUCTION & QUALITY CONTROL		

Handy Check List for Executives and Chief Engineers

If you have a single check in the "can use help" column, you need the services of Pioneer Engineering & Mfg. Co. Our complete, contract engineering services are available when and where you need them. For more information, contact our chief engineer. He'll see that you get it immediately.

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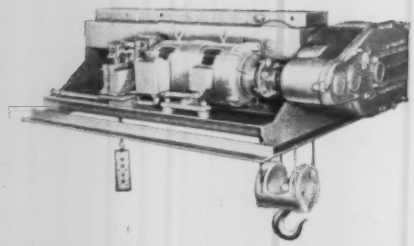
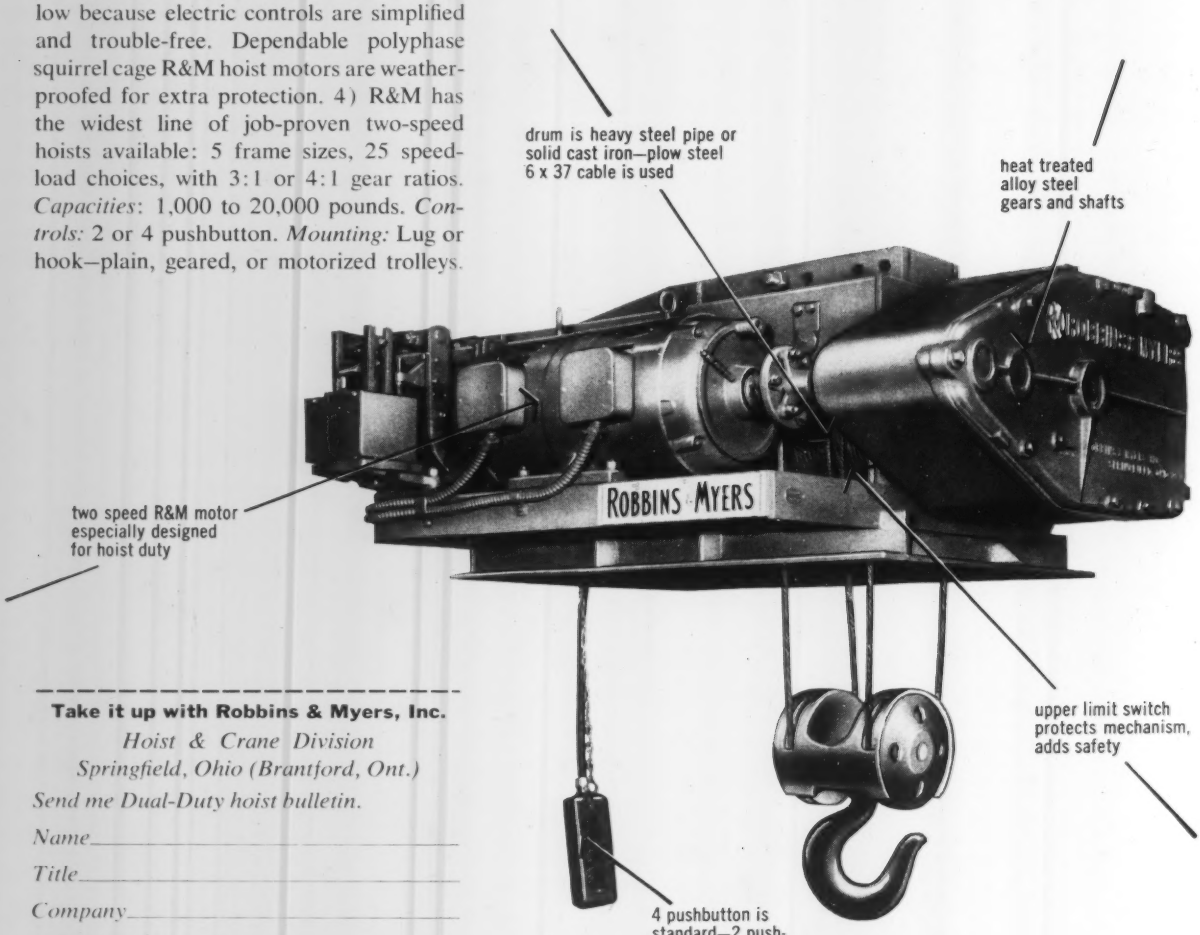
BRANCH OFFICES IN DAYTON, OHIO, WASHINGTON, D. C. and TORONTO, ONT., CAN.



R&M Dual-Duty two speed hoists give you *precise* load spotting, plus fast lifting when you want it. Four outstanding advantages make R&M Dual-Duty hoists your best buy when you can't afford performance compromises: 1) You always have two stabilized speeds to raise or lower any load within the capacity of the hoist. 2) Dual Duty hoists are thus easy to operate—they perform exactly the way the operator wants them to. 3) First cost and maintenance are low because electric controls are simplified and trouble-free. Dependable polyphase squirrel cage R&M hoist motors are weatherproofed for extra protection. 4) R&M has the widest line of job-proven two-speed hoists available: 5 frame sizes, 25 speed-load choices, with 3:1 or 4:1 gear ratios. *Capacities*: 1,000 to 20,000 pounds. *Controls:* 2 or 4 pushbutton. *Mounting:* Lug or hook—plain, geared, or motorized trolleys.

slow spotting, fast lifting hoist


drum is heavy steel pipe or solid cast iron—plow steel 6 x 37 cable is used
heat treated alloy steel gears and shafts
two speed R&M motor especially designed for hoist duty
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upper limit switch protects mechanism, adds safety
4 pushbutton is standard—2 push-button is optional at no extra cost

Take it up with Robbins & Myers, Inc.

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Send me Dual-Duty hoist bulletin.

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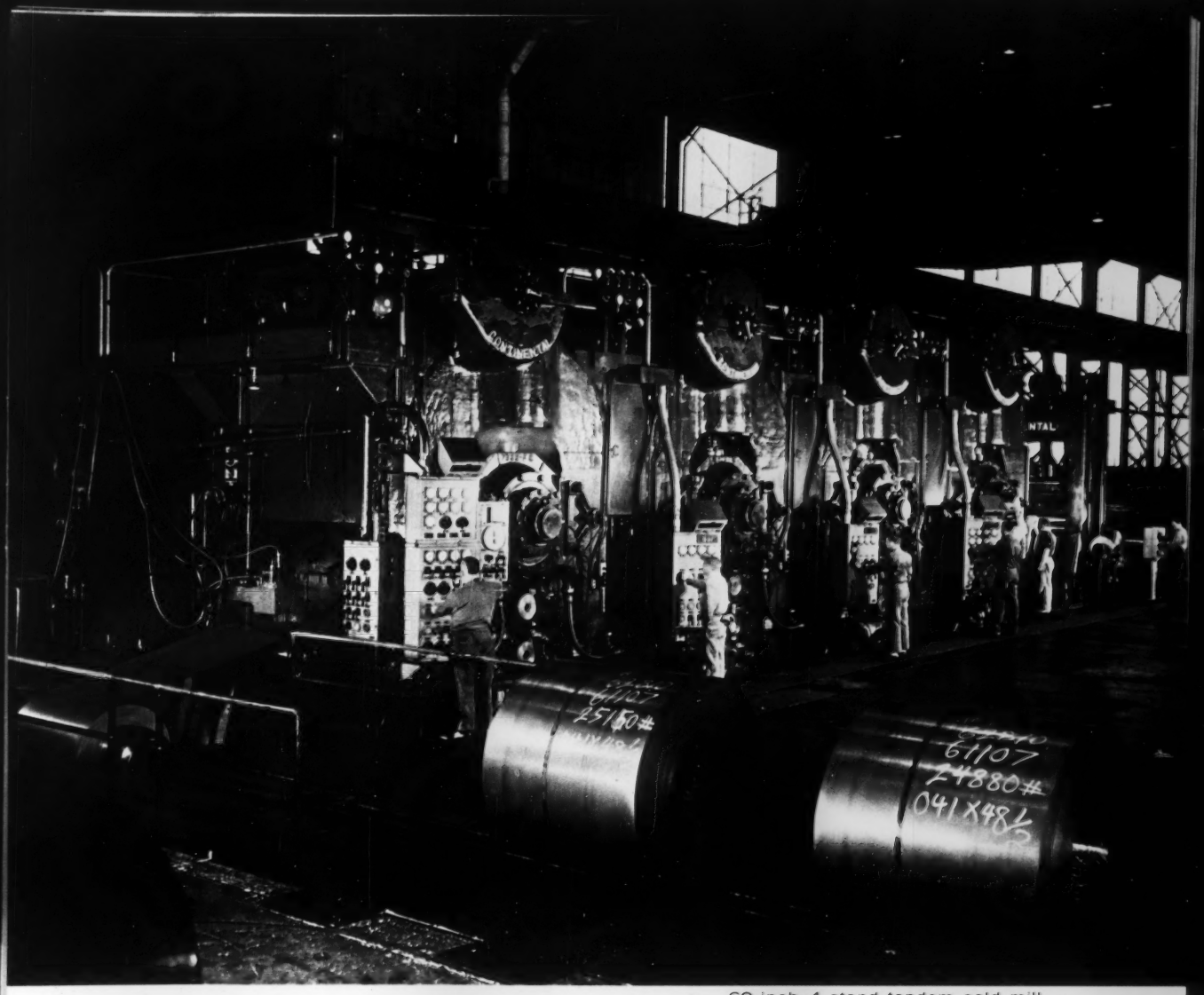

60-inch, 4-stand tandem cold mill

BLAW-KNOX
COLD STRIP MILLS

Blaw-Knox designs and builds all types of cold reduction and temper mills for ferrous and non-ferrous work. Other Blaw-Knox equipment for the metals industry includes complete rolling mill installations including all auxiliary equipment for ferrous and non-ferrous metals, iron, alloy iron and steel rolls, Medart cold finishing equipment, carbon and alloy steel castings, fabricated steel plate or cast-weld design weldments, steel plant equipment, and heat and corrosion resisting alloy castings.

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Foundry and Mill Machinery Division
Blaw-Knox Building • 300 Sixth Avenue
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Two Lewis four-high reversing cold mills used for the cold reduction of strip aluminum and copper-base alloys

BLAW-KNOX high-speed precision non-ferrous mills for rolling thin gauges

Meeting the growing demand for extremely thin non-ferrous metals, requires modern, versatile equipment, capable of high speed production of uniformly high quality.

Lewis four-high reversing cold mills provide built-in versatility and high speed delivery. Electric tension controls permit a substantial increase in the speed and weight of coils being rolled. Automatic X-ray gauge keeps a constant check on thickness. Dual coolant systems make it possible to roll different non-ferrous metals. Operation of the mill is efficient and convenient, with controls placed to provide the greatest convenience for the operator.

Lewis mills for rolling all types of extremely thin non-ferrous metals, have the design leadership that pays off in increased output of uniformly high quality.

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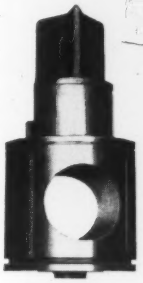
Multiple Port, 100% Pipe Area or Venturi

Diamond Port or "V" Port for Throttling



Round Port 100% Pipe Area

Rectangular Port 100% Pipe Area

Rectangular Port Venturi

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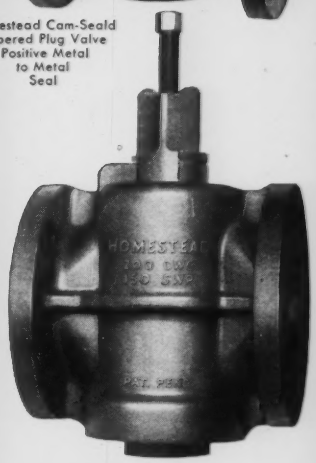
ALL TYPES OF PLUG VALVES

ALL TYPES OF PORT OPENINGS

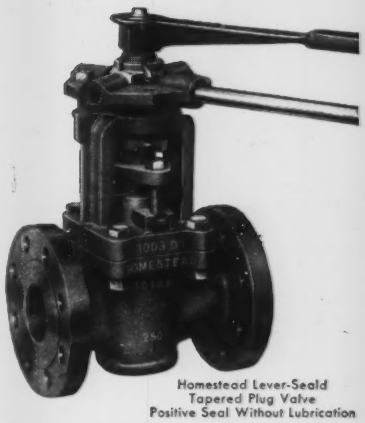
Homestead Cam-Seald Tapered Plug Valve Positive Metal to Metal Seal



Homestead Lubricated Plug Valve High Pressure Chemical Seal

Name the type of valve you need in the metal or alloy you require with the port opening you want—and we can furnish it. Or if you have a valve problem that defies solution, write us, naming the fluid, concentration, temperature, pressure, valve size, function and frequency of operation. We will be happy to recommend the best and most economical valve for your service conditions.

For complete information on Homestead Plug Valves



Homestead Lever-Seald Tapered Plug Valve Positive Seal Without Lubrication

MAIL THE COUPON NOW!

Please send me information on the following Homestead Plug Valves:

☐ Lubricated ☐ Lever-Seald ☐ Cam-Seald

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Company_____

Address_____

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P.O. Box 22 *"Serving Since 1892"* Coraopolis, Pa.

DIFFERENT COMPOSITIONS of G-E Neutralene gas are possible to fit various applications—annealing, hardening, brazing, sintering, and carburizing. G-E gas producers shown are rated at 15,000 CFH; complete line includes ratings from 200 CFH.

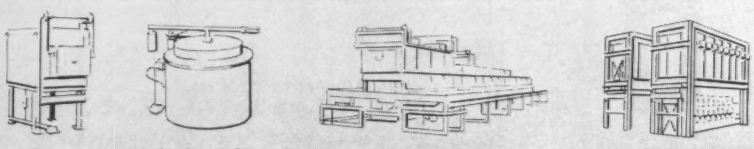
CAPSULE CASE HISTORIES SHOW BENEFITS OF USING PROTECTIVE ATMOSPHERES

OXIDES REDUCED when parts are bright annealed in Exalene gas. Pan on left is shown before cleaning; center pan, after pickling only; pan on right, after bright annealing only. Exalene gas is used also in normalizing, hardening, brazing, and sintering.

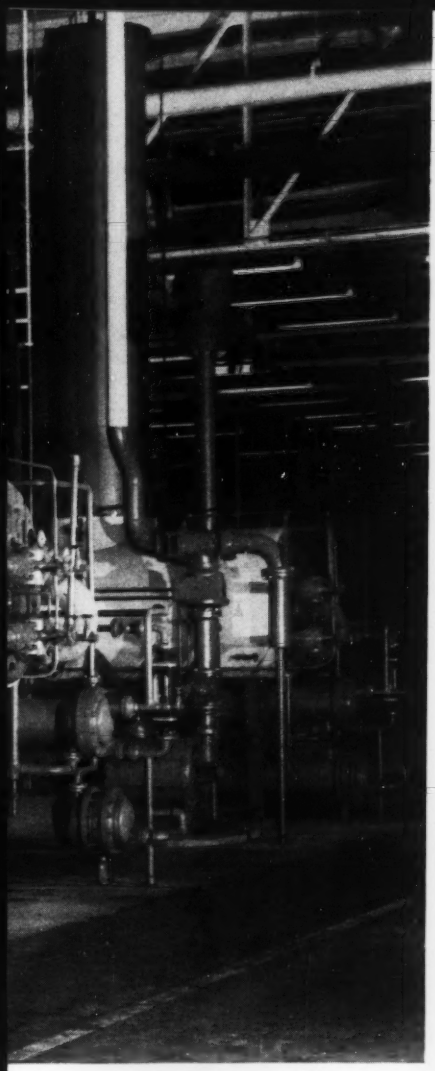
SCALE-FREE UNPITTED drill chuck on right was hardened in Thermalene atmosphere, does not need subsequent cleaning; chuck on left was hardened in air. Thermalene gas is used also in bright annealing, normalizing, brazing, sintering, and carburizing.

GENERAL ELECTRIC SELLS A COMPLETE LINE OF HEAT PROCESSING EQUIPMENT

FURNACES • METAL-SHEATH • INDUCTION



Box | Cylindrical Pit | Roller Hearth | Elevator



Eliminate Expensive After-work—Produce Clean Heat-treated Parts with G-E Protective Atmospheres

Protective atmospheres help you turn out heat-treated parts that are free from scale or oxides. They enable you to turn out a more salable product . . . at lower cost. This is true because pickling, grinding, machining, sandblasting, and similar operations are often made unnecessary.

General Electric offers various types and sizes of gas producers that let you manufacture atmospheres inexpensively—right in your own plant. You can prepare these atmospheres to provide exactly the right quality protection for your particular process. G-E protective atmospheres include: Exalene, an exothermic gas; Neutralene*, a CO_2-free, dry, exothermic gas; Thermalene*, an endothermic gas; Ammalene, dissociated ammonia.

Check these benefits of using protective atmospheres:

PREVENTING OXIDATION of metal surfaces during furnace heating is a primary advantage of protective atmospheres. Parts are produced at less cost and in a shorter total time cycle when scale formation is eliminated.

REDUCING OXIDES which have already formed is easily done by heating in a furnace supplied with the proper protective atmosphere. This reducing, or cleaning, is often used to prepare steel for porcelain enameling, galvanizing, or for furnace brazing.

CONTROLLING SURFACE COMPOSITION of metals in such operations as carburizing, nitriding, and prevention of decarburizing requires closely controlled furnace atmospheres.

ACCESSORY EQUIPMENT to meet specific needs is available:

Sulfur Removers take out sulfur dioxide and hydrogen sulfide where sulfur might harm the work or the furnace.

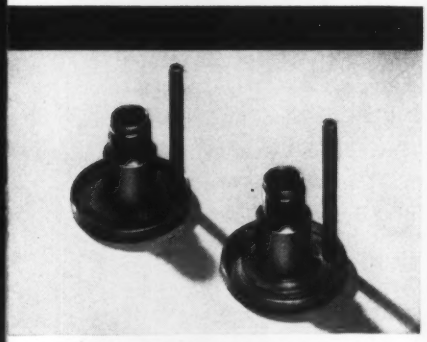
Regenerative-type Dryers remove moisture from gases. Can be had with closed-system reactivation for high-purity uses.

Refrigerated Gas Coolers remove some of the moisture from gases. These coolers may be used with regenerative-type dryers to reduce costs of preparing gases with low dew points.

COMPLETE SERVICES of your local G-E Apparatus Sales Representative include helping you to choose the most effective furnace atmosphere for your particular application . . . and to do it at lowest cost. Call him or send in coupon below for free descriptive bulletin.

*Reg. Trade-mark of General Electric Co.

GENERAL ELECTRIC



CLEANING ELIMINATED when stainless steel parts are brazed in Ammalene gas. Right-hand part is shown as it came from the brazing furnace—bright and clean.

FREE BULLETIN

Section G-721-7
General Electric Company
Schenectady 5, N. Y.

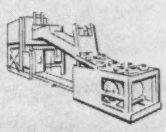
Please send me a copy of your bulletin, Protective Atmospheres, GEA-5907.

NAME .....

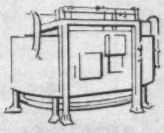
COMPANY .....

ADDRESS .....

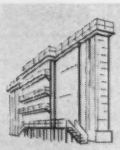
CITY ..... STATE .....



Mesh Belt

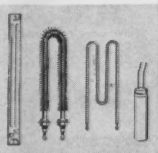


Rotary Hearth

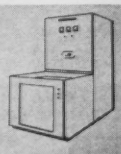


Tower

Cylindrical Bell



Metal-sheath



Electronic Induction

how's this for performance?

15 lbs. of scrap after cutting 156 parts from a 6′ x 10′ plate of ⅜″ steel

Using four torches guided by an electronic tracer, an Airco #48 Duograph automatically flame cut 156 parts from a ⅜″ x 72″ x 120″ steel plate. Of the original 918 pounds of sheet steel, only 15 pounds of scrap remained. Discover the advantages to be gained by using Airco flame-cutting machines for fast, economical production. In addition to the #48 Duograph, Airco flame-cutting machines include the Airco Travograph, Oxygraph, Duograph, Monograph, Camograph, and Radiagraph. Write Airco for complete information and literature.

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Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide — gaseous, liquid, solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetate, alcohols, and other synthetic resins.

NOW for heavy duty grinding . . .

you can have the fast cutting action of a softer grade with long life of a hard wheel

Available with Red Streak Flanges — for metal to metal fit on mounting equipment — another Simonds Abrasive exclusive.

SIMONDS New IL BOND

Try SIMONDS ABRASIVE CO. SNAGGING WHEELS with New IL BOND

It's in the wheel mix! Special chemicals and compounds added to conventional resinoid bonds provide an internal lubricant which increases the abrasive cutting action—yet retains long wheel life.

IL bond gives a distinctly different grinding action on semi-automatic and regular swing frame grinders, on floor stands and portables. IL bond in harder grade will give longer life if your present cutting rate is satisfactory, and IL bond in the same grade will increase cutting action if your present wheel life is satisfactory. Write for descriptive bulletin.

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LOCAL STOCK FAST SERVICE

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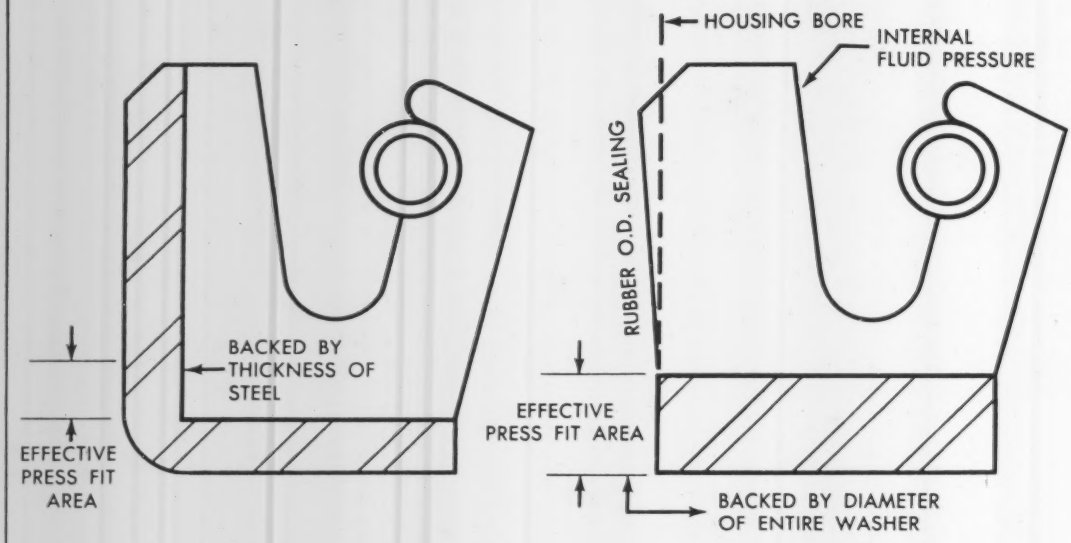
DIVISION OF SIMONDS SAW AND STEEL CO.

BRANCH WAREHOUSES: BOSTON, DETROIT, CHICAGO, LOS ANGELES, SAN FRANCISCO, PORTLAND

Which bonded Seal would you select?



That, of course, depends on your specific problem, but IPC custom designs and molds either type

Illustration A shows a typical design for bonded case seals. Note the area designated as "effective press fit". This is a crucial sealing area above the rounded shoulder of the seal and in this type of construction the "press fit" area is not directly in line with the base of the seal, but is backed by the thickness of the case material and the shear area between the O.D. of case and base of seal. This type of seal is easily installed.

However, in illustration B there are other advantages . . . First, note the thickness of the washer with its squared-off area at the base of the seal. Here the "effective press fit" area is in direct line with a large mass of material. The "press fit" is supported by the entire mass of metal in the heavy washer. This type of seal is especially effective when internal fluid pressures are high and can force the rubber out against the bore. They seal more securely . . . over a longer period of time. Real economy here, too!

Both types of IPC bonded seals are far superior to the old combination of a molded rubber member inserted into a rolled metal case.

That's a quick look at IPC's thoroughness. Whatever your application, IPC will draw on experience and custom compounding skills to provide you with the best solution. Ask your IPC representative for the facts on IPC leather and synthetic oil seals, packings and precision molded products.

PACKINGS • OIL SEALS IPC PRECISION MOLDING

INTERNATIONAL PACKINGS CORPORATION

Bristol, New Hampshire

P3

Spring steel within this range...

FOR THE MOST EXACTING NEEDS KNOWN TODAY!

• That this is the age of specialization is certainly true in the use of steels. And in this regard *Athenia Steel* customers benefit especially by two not-too-common factors. First, by extreme control of quality and uniformity, unsurpassed, seldom equalled *anywhere!* Secondly, by painstaking technical service to determine or develop precisely the right steel for any special need.

Here at Athenia we concentrate on cold rolled high carbon flat steels, custom made of .45 carbon and higher, in widths from .015″ to 16″ and thicknesses from .001″ to .065″. Full range of finishes and tempers. We also produce special narrow width stainless, and the new super-tough, corrosion resistant spring material, Nilcor*.

For a new and profitable experience in service and in steel controlled precisely to *your* needs... try us!

*Trade Mark National-Standard Company

NATIONAL NS NATIONAL-STANDARD Company NILES MICHIGAN **STANDARD**

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *tire wire, stainless, music spring and plated wires* • WORCESTER WIRE WORKS, Worcester, Mass.; *high and low carbon specialty wires*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.; *flat, high carbon spring steels* • REYNOLDS WIRE, Dixon, Ill.; *industrial wire cloth*

New from Standard Oil

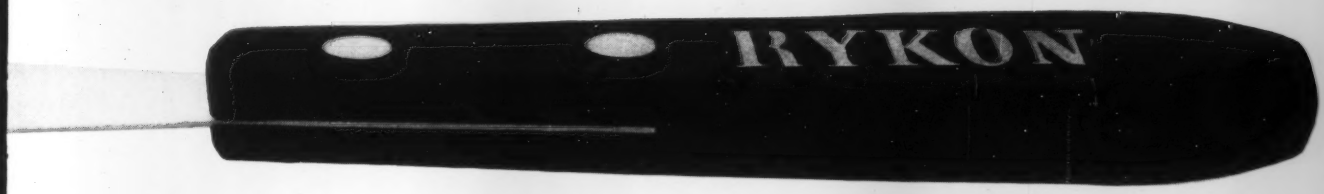
R

Check Chart Of RYKON Greases

Regular Line	Grade Consistency
RYKON Grease No. 0	0
RYKON Grease No. 1	1
RYKON Grease No. 2	2
RYKON Grease No. 3	3
Heavy Duty Line	
RYKON Grease No. 0 E. P.	0
RYKON Grease No. 1 E. P.	1
RYKON Grease No. 2 E. P.	2

RYKON

GREASE



Standard scores major breakthrough in grease technology to bring you better lubrication...help you make important savings in grease use, application and inventorying.

Scientists at Standard Oil, after several years' research, have developed a new non-soap, organic grease thickening agent. This new thickening agent, plus other improvements in grease formulation, is now available in a new line of Standard Oil greases named RYKON. RYKON Greases have all of the desirable properties of the finest quality greases—but to a greater degree. Here are data on the characteristics of RYKON Greases:

Mechanical stability—RYKON Greases show minimum change in consistency under severe mechanical working . . . do not thin out excessively in service.

Oxidation stability—Thickener in RYKON Greases inhibits the absorption of oxygen which prevents free movement, results in bearing corrosion.

Water resistance—RYKON Greases do not lose consistency in presence of water. Resist water washout.

High temperature stability—RYKON Greases have an ASTM dropping point of over 480° F. They have greater heat stability than other petroleum oil greases. At sustained high temperatures, RYKON Greases remain soft and grease-like longer. High temperature range permits the broadest possible application.

Oil separation—There is a minimum bleeding of RYKON Greases in service and in storage.

Wide temperature range — Ability of RYKON Greases to lubricate over a wide temperature range makes them truly multi-purpose greases.

Rust preventive properties—RYKON Greases demonstrate a superior ability to prevent rust.

RYKON Greases are multi-purpose. To meet specific grease lubrication problems, they are formulated in four regular and three heavy duty grades. There is a RYKON Grease to meet every lubrication problem.

With a single RYKON multi-purpose grease doing all jobs in the plant, there's no wrong grease to use. Money invested in grease inventories is cut, storage and application facilities are reduced and maintenance training is simplified. Get the facts about RYKON Greases from the industrial lubrication specialist in the Standard Oil office nearest you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY (Indiana)

University of Michigan's Switching Station
Uses Youngstown "Buckeye" Conduit
to Protect Electrical Wiring Systems . . Permanently

University of Michigan's new, up-to-the-minute, West Hospital Switching Station has positive, permanent electrical system protection—thanks to Youngstown's Full Weight Rigid Steel "Buckeye" Conduit. Damaging elements such as water, moisture, vapor, dust and dirt will never cause electrical faliure—because "Buckeye" will be on the job around-the-clock for the life of the building.

Electrical systems that fail to function properly are definitely a bad investment—from any standpoint. So to make sure your installations are safe and efficient, always specify Youngstown "Buckeye" Conduit—as so many of our leading owners, architects and contractors have done for years.

Satisfied "Buckeye" users across-the-country report to us, "It's easier to thread and bend—easier to fish wires through—and best of all, we get longer service life because it's so thoroughly corrosion-resistant."

Leading distributors in all industrial and electrical markets are ready to serve you quickly and efficiently from their ample stocks. They're as near as your phone—why not call today?

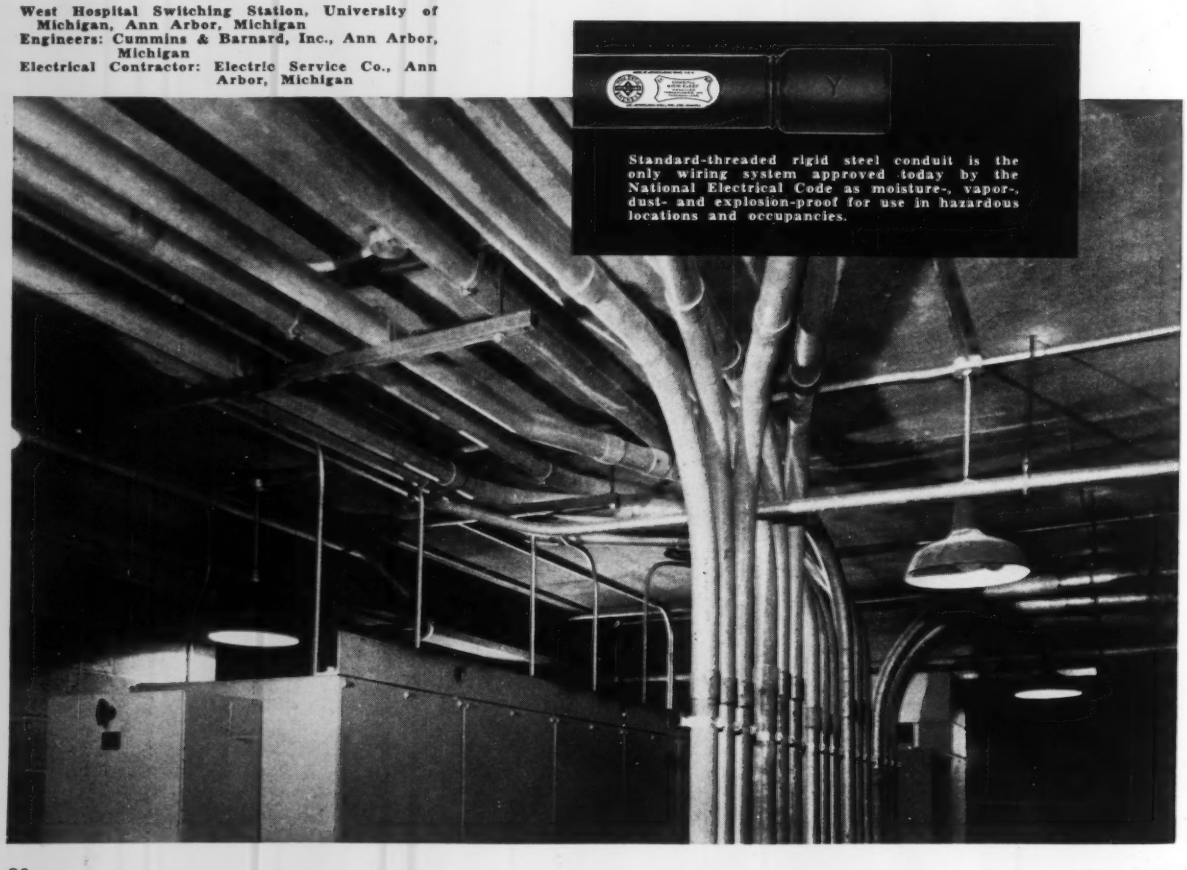
THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

District Sales Offices in Principal Cities

West Hospital Switching Station, University of Michigan, Ann Arbor, Michigan
Engineers: Cummins & Barnard, Inc., Ann Arbor, Michigan
Electrical Contractor: Electric Service Co., Ann Arbor, Michigan



Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

BULLARD

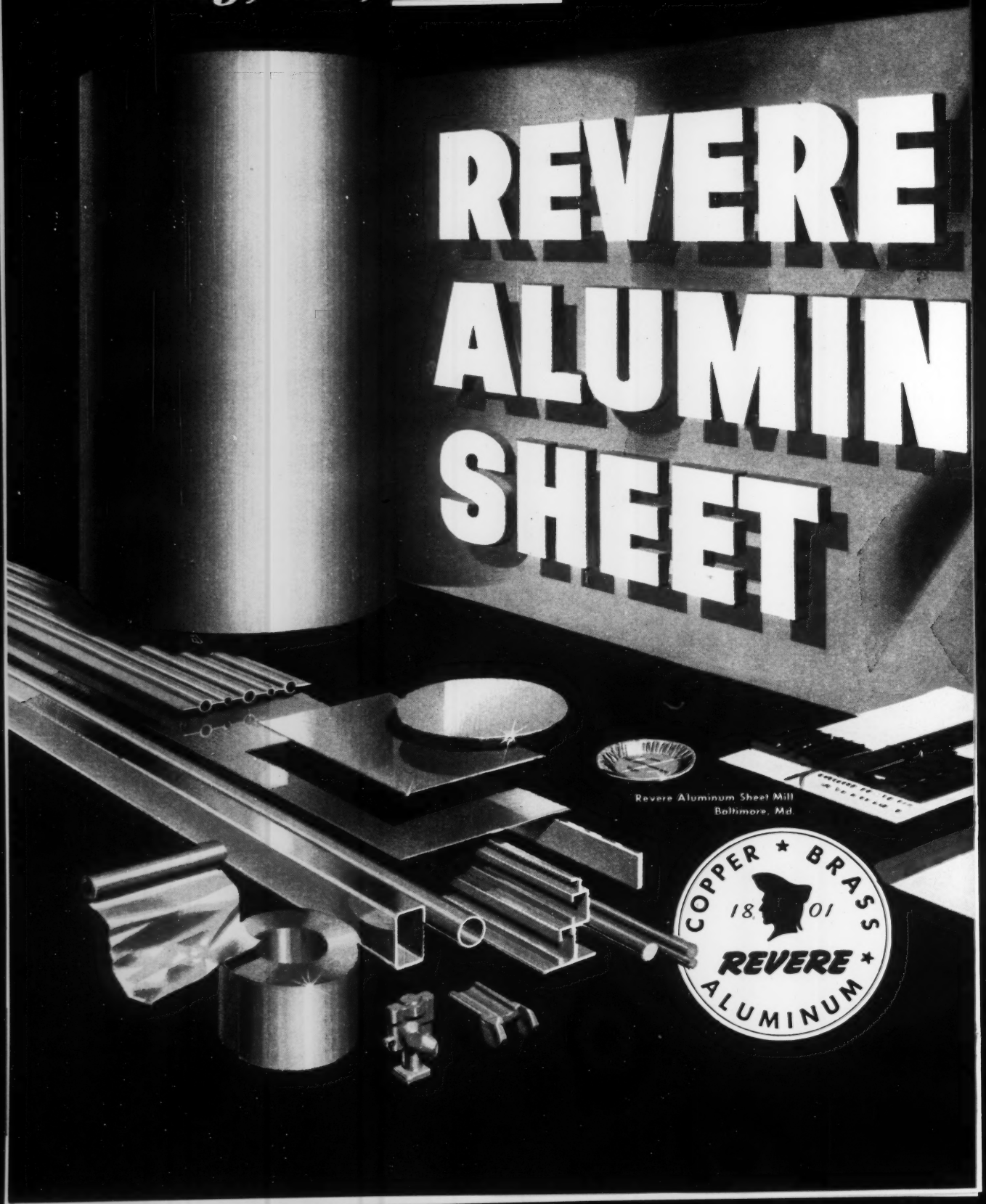
"Less Maintenance—Less Down Time Increased our Production"

This statement by Methods Supervisor Raymond Hoss of the Ingersoll Milling Machine Company of Rockford, Illinois summarizes one of the benefits they received from the purchase of a 36" Cut Master V.T.L., Model 75. Less operator fatigue, higher speeds, power chucking and power indexing turret are other factors which increase the overall production obtained with Bullard Cut Master, Model 75.

These same benefits can be applied to your production problems—just call your nearest Bullard Sales Engineer—he'll be glad to help—or write

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

Ready, Set, GROW...with



New Revere Aluminum Sheet Mill
Chicago, Ill.

You will find that Revere Aluminum Sheet passes smoothly and economically through your processes, that it brings to your products all the advantages you expect from fine aluminum.

Three Revere plants, located in the East, the Mid-West and on the Pacific Coast, can bring mill service and technical consultation close to your own doorstep. These plants will have the backing of Revere's primary aluminum operation, scheduled to begin production in 1958.

It will pay you to tie the growth of your business to the most dependable sources of supply—such as Revere, which is in aluminum in a BIG WAY. Revere Copper and Brass Incorporated. Founded by Paul Revere in 1801. Executive Offices: 230 Park Avenue, New York 17, N. Y.

Revere Aluminum Mill Products include coiled and flat sheet, both plain and embossed, circles, blanks, Tube-In-Strip, extruded products, seamless drawn tube, welded tube, rolled shapes, electrical conductors, forgings, foil and frozen food containers.

← Projected for 1957: New Revere Aluminum Sheet Mill Santa Ana, Calif.

Any Welding Job AC or DC can be handled with one machine

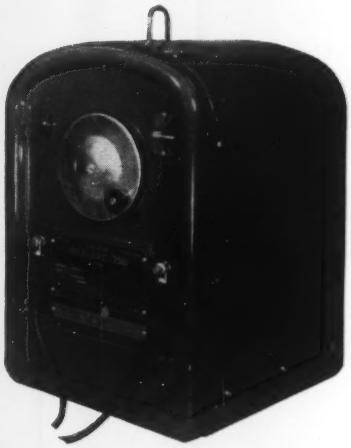
That's why it pays to standardize on

LINCOLN IDEALARC

This job required DC welding . . . The next job needed AC.

WITH Lincoln Idealarcs you can schedule any welding job on any machine. You can take any machine to any job. You can do these things because every Idealarc can give you both AC and DC welding current . . . whichever is best for the particular job.

Hadn't you better standardize on Idealarc? Write for Bulletin SB-1343 and SB-1364 for facts.



Idealarc AC/DC Welder available in 180, 250, 300, 400, 500 amp. sizes.

THE LINCOLN ELECTRIC COMPANY
Dept. 1629, Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

When one welder IDEALARC **Has** both AC and DC **Yet** costs less to buy and operate

WHY use anything but IDEALARC

Eagle Manufacturing Company, Wellsburg, West Virginia, called on Weirkote's deep-drawing capabilities for its new, seamless gasoline and oil cans

WEIRKOTE® ZINC-COATED STEEL CAN BE SHAPED TO ANY PRODUCT SPECIFICATIONS!

Using Weirkote zinc-coated steel, the Eagle Manufacturing Company gives us a much needed improvement in gasoline and oil can construction. A container with a smooth, seamless-drawn, dome-shape shell.

Result? This smooth, dome-shape top leaves no place for grease, dirt and moisture to collect. And by eliminating top and side seams, chance of leakage is almost nil. (There's a double-seamed bottom, further insuring a leak-proof container!)

Eagle uses Weirkote for this tough drawing job for these specific reasons: Weirkote zinc-coated steel can be worked and shaped to the very limits of the steel base itself. Its zinc-coated "skin" will not flake or peel under even the most severe fabricating stress. Thus, any chance of corrosion is eliminated.

Here's a material for your product that combines the corrosion resistance of zinc with the proven superior strength of steel. And Weirkote has the inherent flexibility to completely "obey" *all* your shaping stresses.

Weirkote will form to *your* requirements, too. Let us show you how it can do any job for you—*better!* Send today for free booklet on Weirkote. Write Weirton Steel Company, Dept. B-19, Weirton, West Virginia.

WEIRTON STEEL COMPANY

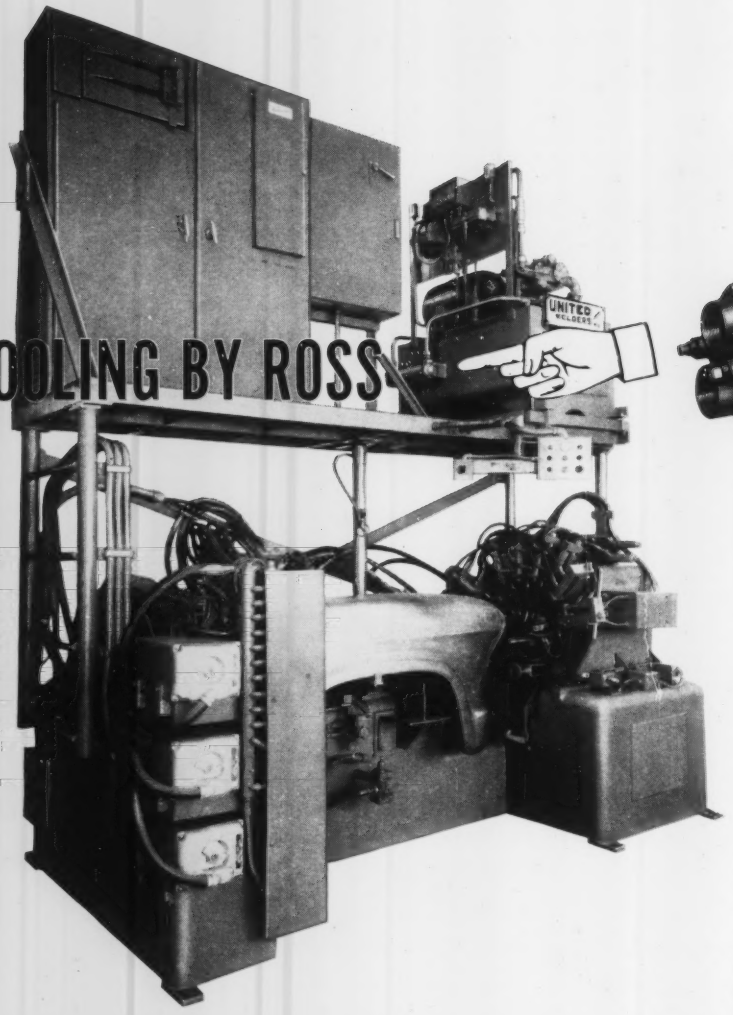
WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

a division of

NATIONAL STEEL CORPORATION

OIL COOLING BY ROSS



United Welder turns out 360 fender assemblies per hour

Securing headlights, vertical and top reinforcement brackets to commercial and truck front fenders, this United Special Multiple Spot and Projection Welder mass produces approximately 360 completely welded fender assemblies per hour.

To maintain constant speeds of the hydraulically driven gun carriages as they move in and out of weld position, a Ross Type BCF Exchanger has been installed as original equipment. Fully integrated into the hydraulic system, the exchanger provides constant cooling to prevent pump slippage from overheated, thinned oil.

"Our engineers highly recommend the (Ross) exchanger's straight-through flow method of fluid cooling, and the ease with which it is incorporated into our hydraulic unit design," reports United Welders Inc.

Combining extreme ruggedness and high thermal efficiency, Ross Exchangers are installed with impressive regularity on practically every type of machinery requiring temperature control of lube oil, jacket water and hydraulic fluid. Pre-engineered and fully standardized, they're available in a wide range of sizes to meet your heat transfer requirements.

Bulletin 1.1K5 will give you detailed information. Write. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN-Standard

THERE'S A
COMPLETE LINE OF ROEBLING

Galvanized

ROEBLING is a specialist in galvanizing, with practically unmatched facilities for producing galvanized wire in enormous quantities and in complete size ranges. Hot galvanized is available in sizes from .283″ to .035″... Roegal (drawn galvanized) from .187″ to .005″.

And Roebling galvanized wire can be packaged in the way most convenient and economical for you... in coil diameters of 60″, 30″, 22″, 16″ and 8″...on reels, spools or handy spoolless cores.

You *pay* for the best when you buy galvanized wire. Make sure you *get* it—specify Roebling! John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • ROCHESTER, 1 FLINT ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • ST. LOUIS, 3001 DELMAR BLVD. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

Vibration won't loosen FLEXLOC self-locking nuts

Where products must be reliable . . . must stand up under vibration, temperature extremes and hard use . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts.

HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform; carefully manufactured to assure accurate, lasting locking action. And they are reusable: repeated removal and replacement, frequent adjustments, even rough screw threads will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes, types and materials to meet the most critical locknut requirements. Your local industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 33, Pa.

FLEXLOC® LOCKNUT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

Something new... made better by aluminum

Aluminum "sail" of atomic sub breaks water as ship surfaces. "Sail" is the protective sheathing around superstructure and controls.

New alloys make aluminum a seagoing metal

The new atom-powered submarines "Nautilus" and "Seawolf" offer dramatic proof that aluminum can be just as much at home in salt water as on dry land. Both of these modern vessels are equipped with streamlined aluminum sheathing above decks to reduce topside weight. Other interesting marine uses of aluminum include a speedy new Canadian subchaser, the superstructure of passenger ships like the new Norwegian liner *Bergensfjord* and the S. S. United States and hundreds of different types of pleasure craft.

Key to the use of aluminum in many of these marine applications is the development of special alloys and welding techniques by Aluminium Limited research. With these problems solved, aluminum fabricators are sure to find larger markets in the shipbuilding field.

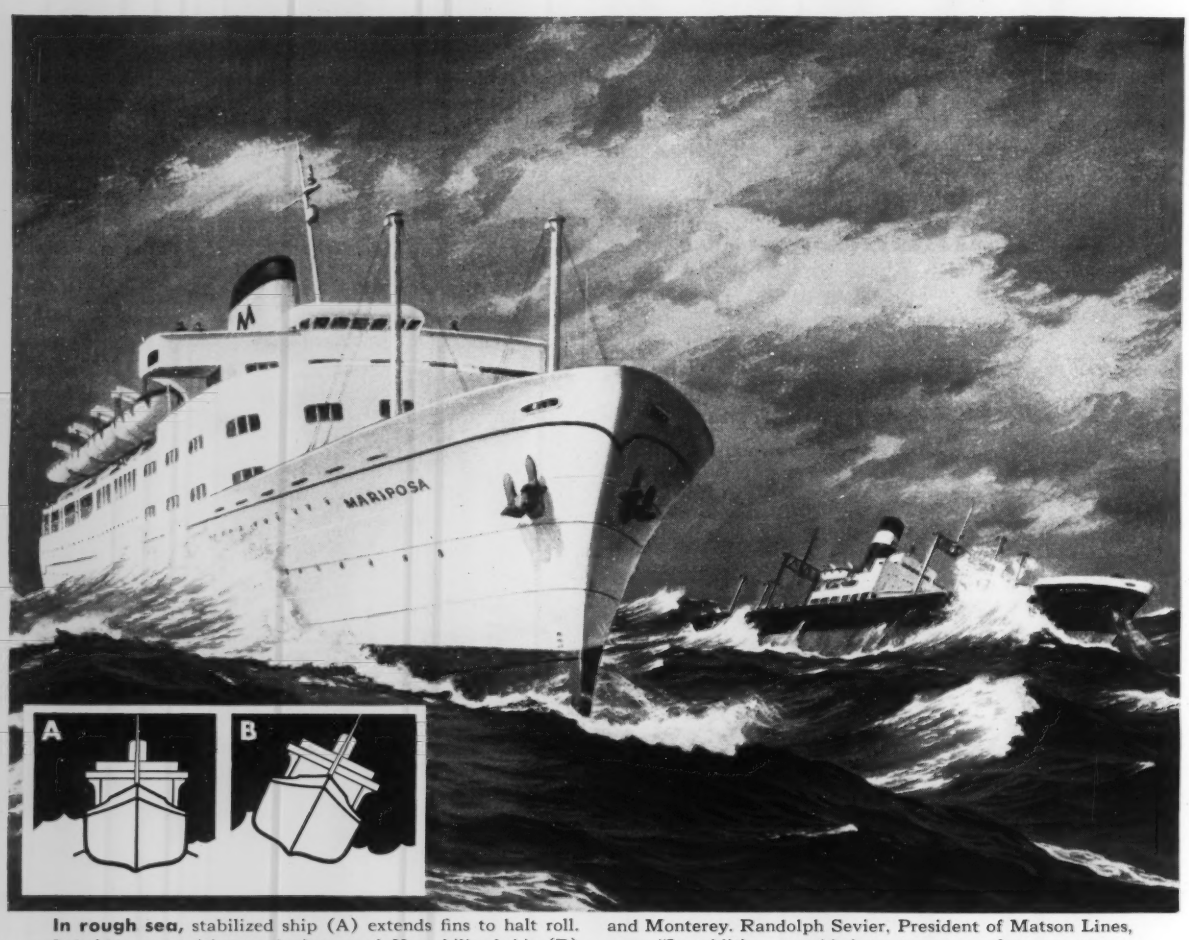
Through research, new and different uses for aluminum are broadening fabricators' markets everywhere. To help assure a dependable supply of primary metal for independent fabricators, Aluminium Limited is investing $3,000,000 a week in additional production facilities.

Supplying U. S. industries with primary aluminum from Canada

Aluminium Limited Sales, Inc.

630 FIFTH AVENUE • NEW YORK 20, N. Y.

CLEVELAND • CHICAGO • DETROIT • LOS ANGELES • BUENOS AIRES • SÃO PAULO



In rough sea, stabilized ship (A) extends fins to halt roll. It holds course without reducing speed. Unstabilized ship (B) rolls and is forced to cut speed. First two commercial installations of the Gyrofin are on the Matson Lines, Mariposa and Monterey. Randolph Sevier, President of Matson Lines, says, "In addition to added passenger comfort, we expect to realize savings in fuel and time because the ships will be able to maintain course and speed in heavy weather."

Imagine – smoothing out the ocean!

When the sea plays rough, it shows no respect for a ship.

But the days of rock 'n' roll – seagoing variety – are numbered.

Credit this to an amazing device. It's Sperry's new Gyrofin® Ship Stabilizer, almost human in the way it out-thinks and outwits rough weather.

The Gyrofin takes the pulse of the turbulent sea . . . immediately sets underwater stabilizing fins to work producing "lift" which counteracts the action of the waves.

Two fins, only 14 feet long, help to hold a 20,000-ton ship smooth and steady on her course. They eliminate up to 90% of roll that might shift cargo, slow speed, spill soup or otherwise spoil a voyage.

Opposing a raging sea puts a terrific strain on these fins, of course. The 6,000 foot-tons of "lift" they deliver may change direction every two seconds! So the entire assembly has to be able to take it.

That's why Sperry chose strong, corrosion-resisting nickel-copper alloys for so many vital parts. The fin flap "hinge pins"—fourteen feet long but only four inches in diameter – are "K" Monel* age-hardenable nickel-copper alloy. Spacer ring "washers" . . . Monel* nickel-copper alloy. Fin control surfaces . . . welded Monel overlay. These nickel-copper alloy parts are designed to take all the punishment that battering tons of sea water can offer. *And they do!*

• • •

If you have a metal problem in which corrosion, high or low temperatures, stresses or fatigue are troublesome factors, talk it over with us. Let's see if Monel alloy – or one of the more than fifty other Inco Nickel Alloys – can help overcome *your* difficulty. *Reg. U. S. Pat. Off.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO TRADE MARK

INTERNATIONAL NICKEL
Nickel Alloys Perform Better, Longer

STEEL

May 27, 1957

Metalworking Outlook

Tool Shipments Up, Orders Down

Look for an upturn in machine tool orders for the second half. Net new orders in April slipped to $51.3 million, and the estimated backlog at the end of the 30 days dropped to five months. But April shipments were high —$88.1 million, compared with $89.1 million for March and $71.8 million for April, 1956. Shipments in the first four months this year reached $331.5 million, compared with $265.2 million in the same 1956 period.

Diemakers See $1 Billion Year

Watch for the contract tool and die industry to show shipments of more than $1 billion in 1957, for the second year in a row. The volume of orders in most tool centers is a little above that of a year ago. Automotive, electronic and business machine industries are most active in placing orders. Guided missile tooling is beginning to be important.

More Spending in the West

Business spending will increase more in the West than in other parts of the nation. Dr. Robert A. Dockson of the University of Southern California reports that spending for plant, equipment, research and development generally will average 6 to 7 per cent more in 1957 than in 1956. But in the 11 western states, iron and steel industries will boost their outlays by 42 per cent over 1956, the aircraft industry by 71 per cent, the chemical industry by 31 per cent and the nonferrous industry by 66 per cent. Western manufacturers expect to increase plant capacity in 1957 by 6 per cent, the same as during 1956.

New Car Stocks Climb

Dealers' stocks of new cars are around 800,000, about a 40-day supply at current sales rates. The inventory is below year-ago levels, but then the 900,000 count was at an all-time high. In a little more than six months, new car stocks have risen by about 550,000. In the six months that preceded last May, the rise was just 325,000. Much of the present rise in inventories is accounted for by General Motors Corp.'s sales declines.

More British Autos for U.S.

U.S. sales of British-made autos during the first quarter this year increased 160 per cent over the volume for the same 1956 period. That means 11,662 units were sold, compared with 4483 for the first quarter last year. British sales are accounting for 33 per cent of all foreign cars sold in the U.S., compared with 25 per cent a year ago.

Iron Ore Prospects Bright

Five direct reduction processes are being studied to by-pass the blast furnace entirely. So reports H. Stuart Harrison, vice president of Cleveland-

Technical Outlook—p. 93 Market Outlook—p. 141

Metalworking Outlook

Cliffs Iron Co. Franklin G. Pardee, president of Lake Superior Iron Ore Association, estimates that 24 billion tons of iron ore reserves exist in the Lake Superior region, much of it low grade. "When treated," he says, "this will amount to 8 billion tons of furnace material, enough to last our blast furnaces for 200 years at the present rate of consumption."

Metals for the Air Age

Aircraft Industries Association forecasts these requirements must be met by aircraft material developers in the next decade: Alloys capable of withstanding 2000-3500°F will be using chromium, beryllium, vanadium, molybdenum, niobium, rhenium, silicon, tungsten and tantalum. It will also be necessary to extend and evaluate the physical requirements of aluminum to 500°F, magnesium to 800°F, titanium to 1200°F and steel alloys and specialty steels to 1200°F in wrought, forged and cast forms. Electric wiring, magnetics and semiconductors will have to meet temperatures of 1000°F.

Generals Don't Fade Away

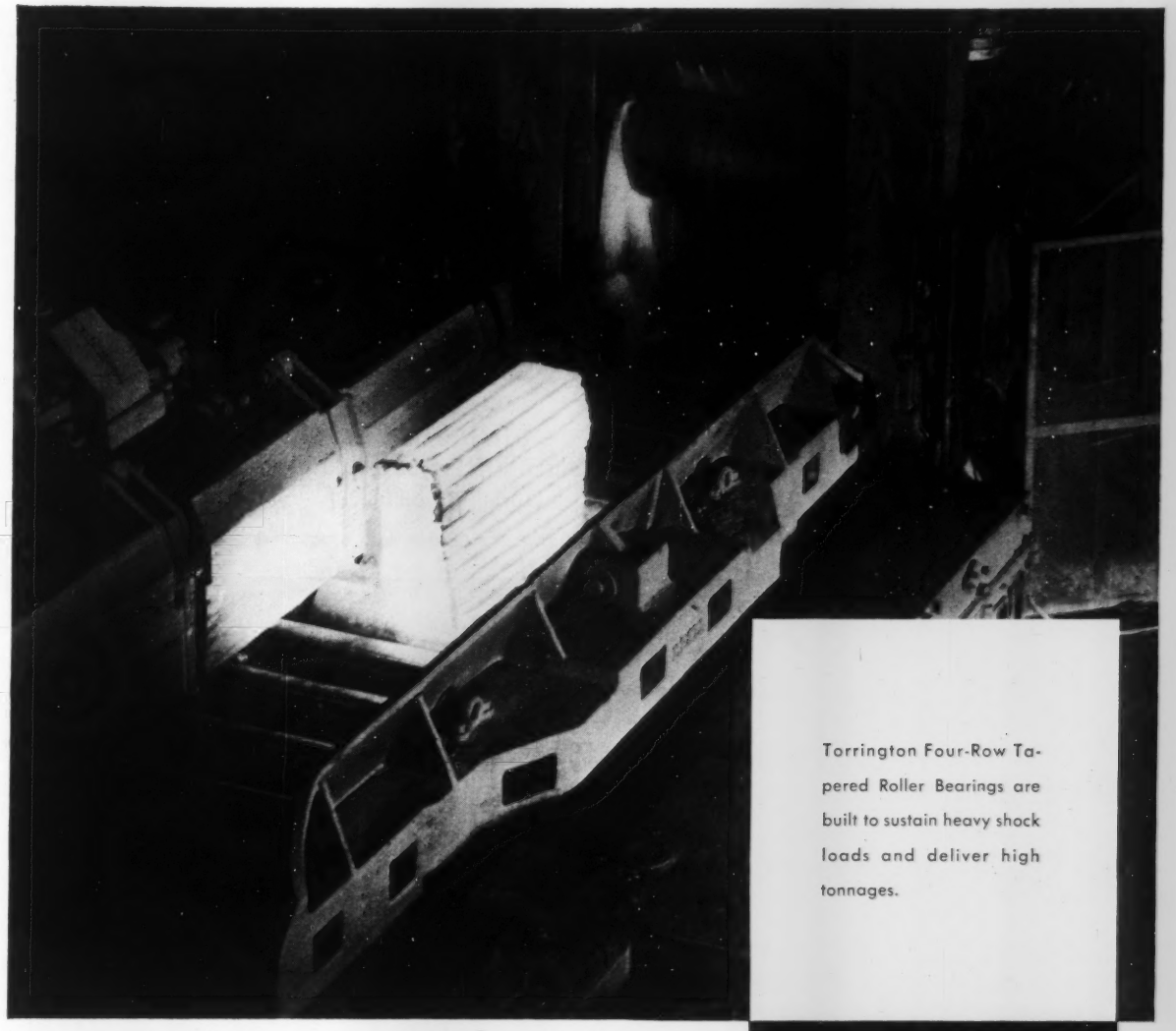
The Pentagon says that 108 former officers of the ranks of brigadier general and rear admiral or above have "received security clearances" to represent their firms in dealing with the Defense department. A Senate Preparedness Investigating subcommittee thinks "this number is a small fraction of the total of former department personnel now in private industry and engaged in the procurement of defense contracts." Recommendation of the subcommittee: That Defense set up regulations affecting such personnel to avoid possible conflict-of-interest charges.

Clerical Population Soars

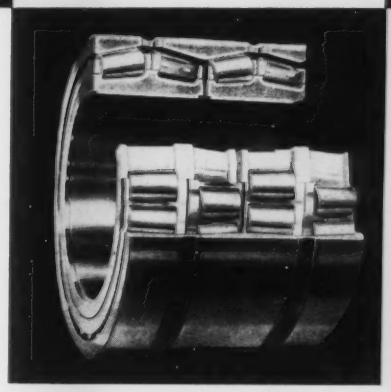
The clerical population is multiplying five times faster than the total population. Says W. Clayton Hill, General Electric Co. consultant: "When the time comes that it takes more administrators than producers to keep business going, the wagon could well break down." It costs a company about $1550 to create the contents of a single file drawer. Record consultants have found 7 to 15 file drawers per employee in many firms. In a company returning 5 per cent net profit to sales, a $5000 administrative expense reduction represents equivalent net income to $100,000 of sales billed.

Straws in the Wind

The Labor department has compiled a report that strongly implies that excessive wage increases have been a key cause of the rise in prices of the last decade . . . Republic Steel Corp. will spend a record $160 million this year on capital improvements.



Torrington Four-Row Tapered Roller Bearings are built to sustain heavy shock loads and deliver high tonnages.



When the squeeze is on!

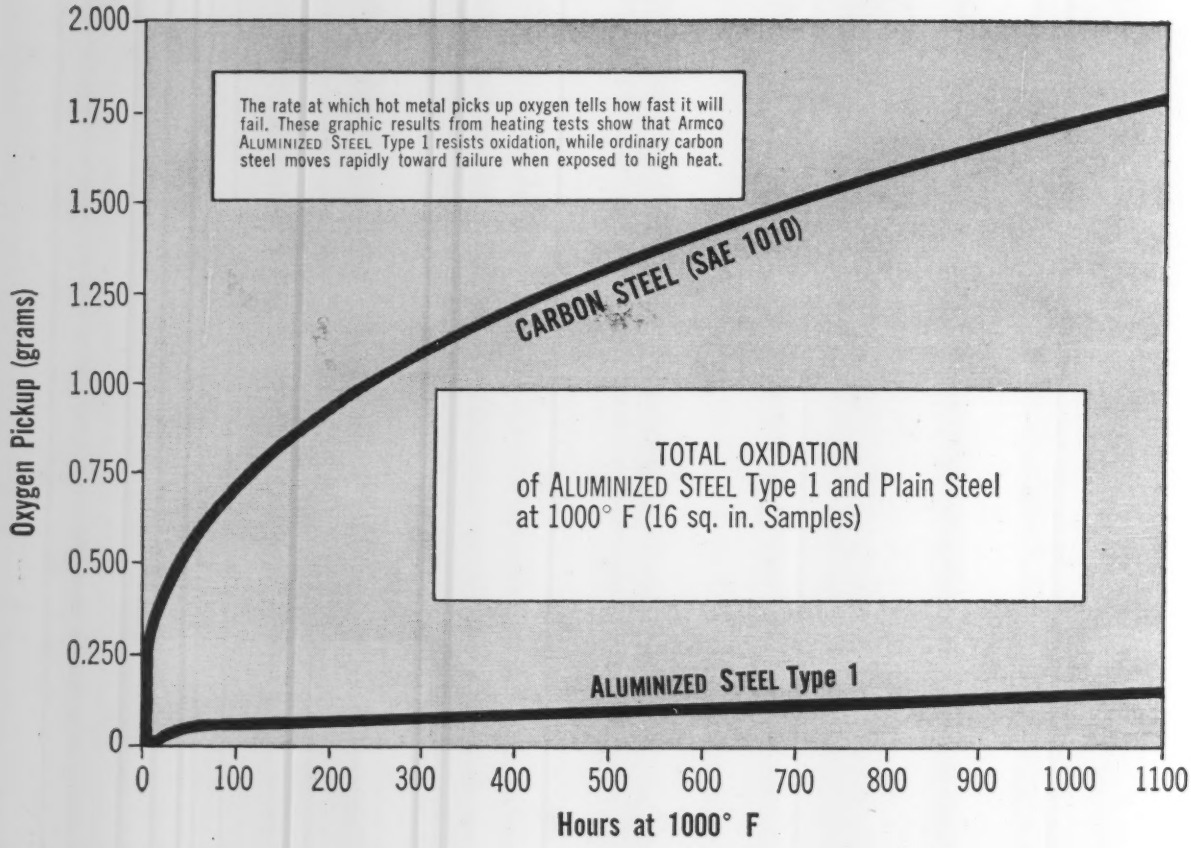
Under the pressure of high production schedules, Torrington Bearings handle heavy thrust and radial loads with reliability and stamina that mean *tonnage* with *economy*. Only the finest electric furnace steel is used in their construction. Races and rollers are carburized and heat-treated for toughness, stability, hardness and uniformity. Precision tolerances and finishes mean minimum friction, low eccentricity and uniform load distribution.

Torrington Work Roll Bearings come in many standard sizes in both two-row and four-row, with either pin-type or cast-bronze, land-riding cages. For handling any combination of radial and thrust loads, you can do it better with Torrington Bearings. **The Torrington Company, South Bend 21, Ind.—and Torrington, Conn.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

TAPERED ROLLER • SPHERICAL ROLLER • CYLINDRICAL ROLLER • NEEDLE • BALL • NEEDLE ROLLERS • THRUST


The rate at which hot metal picks up oxygen tells how fast it will fail. These graphic results from heating tests show that Armco ALUMINIZED STEEL Type 1 resists oxidation, while ordinary carbon steel moves rapidly toward failure when exposed to high heat.
CARBON STEEL (SAE 1010)
TOTAL OXIDATION
of ALUMINIZED STEEL Type 1 and Plain Steel
at 1000° F (16 sq. in. Samples)
ALUMINIZED STEEL Type 1
Oxygen Pickup (grams)
2.000
1.750
1.500
1.250
1.000
0.750
0.500
0.250
0
0 100 200 300 400 500 600 700 800 900 1000 1100
Hours at 1000° F

Test Shows How Well Armco ALUMINIZED STEEL Resists Heat

Armco ALUMINIZED STEEL® Type 1 (steel hot-dip coated with aluminum) stands up to heat because it withstands destructive scaling. This test shows how well.

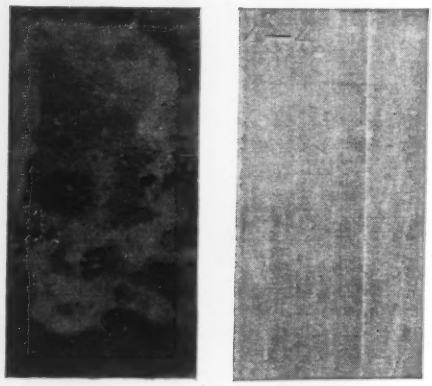
Above 900 F, an iron-aluminum alloy forms on the surface of Armco ALUMINIZED STEEL Type 1. It becomes a tightly-adherent refractory material that protects the base metal. Ordinary carbon steel lacks this protection. The powdery and flaky oxides which form on the surface of carbon steel fall away, exposing it to further attack.

Economical Double Protection

Armco ALUMINIZED STEEL Type 1 not only resists heat, it fights corrosion at the same time. In fact, this special 2-in-1 metal beats back deadly combinations of heat and corrosion better than any metal in its price class.

If parts of your products are exposed to a combination of heat and corrosion, it may pay you to get all the facts about Armco ALUMINIZED STEEL Type 1. It could be a low-cost solution for your problems.

Complete information on this special coated steel is readily available. Just call your nearby Armco Sales Office or write us at the address below.



After 1100 hours at 1000 F. **Right**—Armco ALUMINIZED STEEL Type 1; **Left**—SAE 1010 Steel.

ARMCO STEEL CORPORATION

1537 CURTIS STREET, MIDDLETOWN, OHIO

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Steel Looks Ahead

While listening to men prominent in steel industry management speak before the American Iron & Steel Institute in New York last week, we were reminded of the transition in the industry's thinking and planning.

Steel capacity in 1900 was only 21.2 million tons, or less than a sixth of what it is today; our population was 76 million, or less than half the present figure; steel capacity was 555 lb per capita, or less than a third of what it is now.

In the first 40 years of this century, steel capacity quadrupled but little more than doubled on a per capita basis. The industry was only beginning to feel the effects of the change from heavy to lightweight steel materials that were opening up so many new markets.

As late as 1940, government and labor were worried about the continuous strip mills putting men out of work, and there was talk about the 30 hour week. Then came wartime expansion in steel. After the peace, 4 million tons of obsolete capacity were abandoned.

Perhaps the steel industry started its postwar expansion too slowly, but it could not forget the depressed operations of the 1930s and the fact that prewar consumption had never exceeded 978 lb per person. Explosive growth in population fooled all the experts.

In recent years, the steel industry has switched from mild conservatism to a bold new optimism which stems from better market research (19 companies have commercial research departments), more intensive technological research and aggressive management. This new brand of thinking was in evidence at the AISI meeting.

Chairman Roger Blough of U.S. Steel feels that the most difficult problem facing management is not temporary drops in steel production but one of striving to keep pace with the enormous demand for steel that lies ahead. The industry, he says, will need 50 million more tons of capacity in the next 18 years (185 million tons by 1975).

Chairman Charles M. White of Republic Steel says we will need 160 million tons of capacity by 1967 (26.5 million more than we have today). His prediction is based on the composite opinions of 200 experts which are reported in a book *USA—Tomorrow*, just published by Republic.

Those experts find that with a population of 190 million and a work force of 76 million, gross national product may reach $560 billion or more by 1965. There will be 7 million more households.

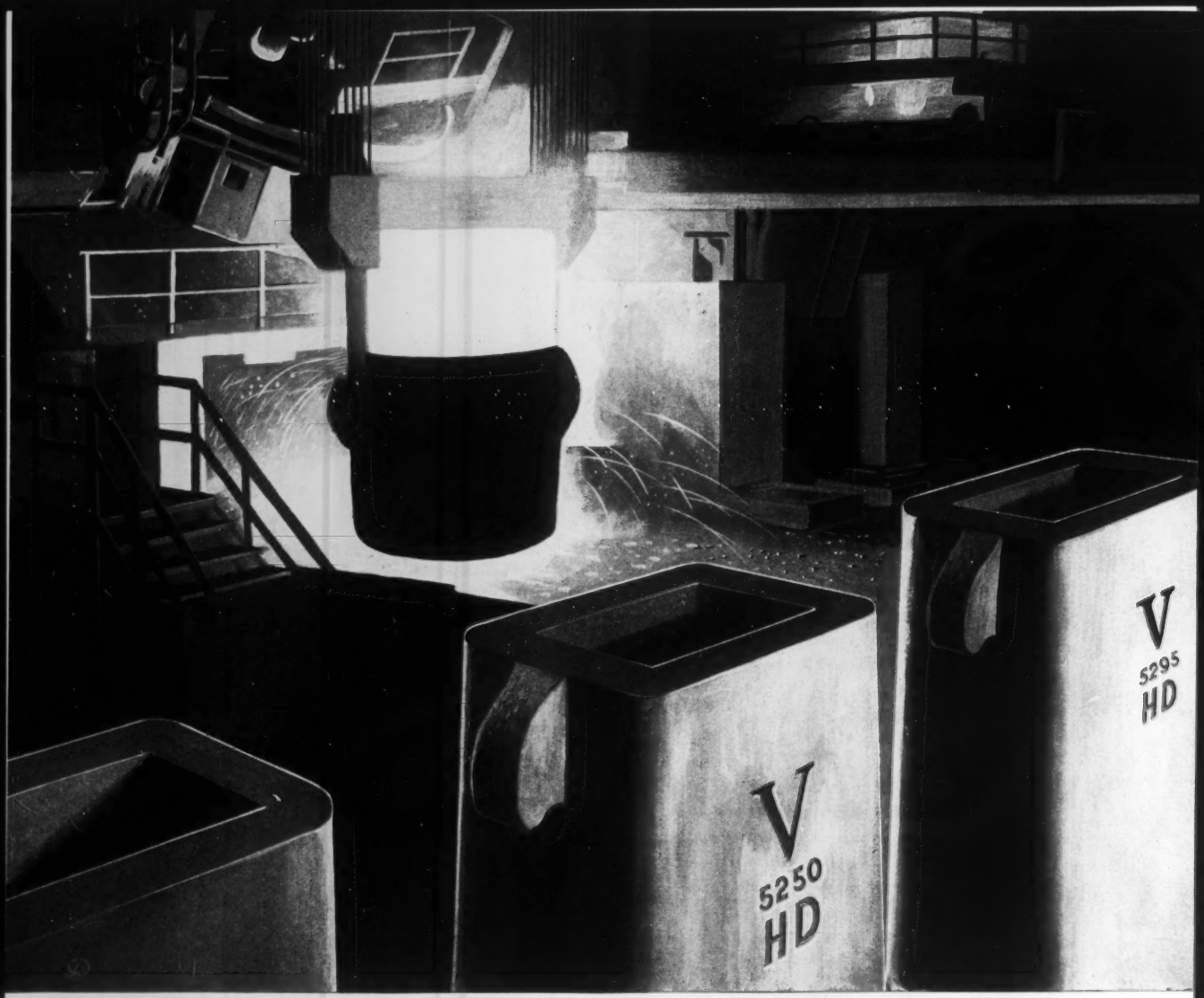
Annual outlays for plant and equipment may exceed $50 billion by 1965. The steel industry will spend $1 billion a year. Auto sales will average 8 million units a year. The use of electricity and sale of electrical products will double.

The steel industry is looking ahead with justified optimism.

We hope the entire metalworking industry finds it contagious!

Irwin H. Such

EDITOR-IN-CHIEF



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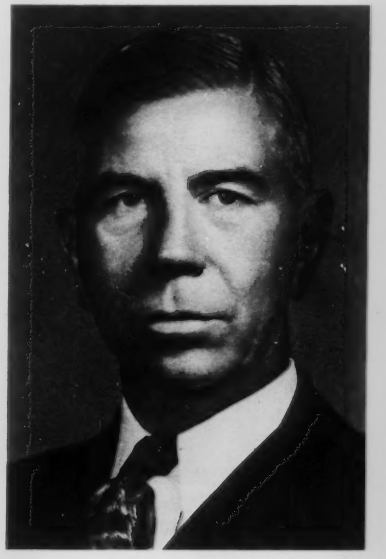
BENJAMIN F. FAIRLESS
President, AISI

ROGER M. BLOUGH
Chairman, U.S. Steel Corp.



C. M. WHITE
Chairman, Republic Steel Corp.

Steel Fights the Squeeze

Pressure comes from wage costs that outpace productivity and expansion expenses that outrun depreciation allowances, Messrs. Fairless, Blough and White tell AISI meeting

STEEL'S wage costs outpace productivity gains, and expansion expenses outrun depreciation allowances.

Those imbalances combine to give the steel industry one of the knottiest problems in history, says Benjamin F. Fairless, president of the American Iron & Steel Institute. He told the organization in New York last week: "Funds that should be available to help insure growth for the future are going into the high cost of standing still."

Paying Problem—Stressing that the industry has a "vast and vital responsibility to go forward with expansion of its productive capacity," he outlined needs and discussed aspects of the problem of paying for expansion.

"All excessive wage demands on the industry," he charged, "are not only inflationary, but are ultimately canceled out in a large measure by inflated dollars. Increasing harm is done to the workers, consumers and the industry itself.

"Industry's earnings are left inadequate for the required replacement and expansion of facilities, while the costs of replacement and expansion continue to rise."

Commenting on low depreciation allowances, he said: "Steel companies are being required to use an increasingly greater part of their so-called profits just to replace facilities as they wear out."

Expansion Problem—Emphasizing the effects of inflation, he estimated that the steel industry's modernization and expansion program during the past decade, in which 42 million tons of new steel capacity were built, would have cost roughly $5 billion at construction costs prevailing in 1946. "Actually," he said, "the cost has been higher to the extent that, for the same facilities, $3 billion of additional expenditures have been required. And I need not tell you that this upward pressure is continuing.

"At the same time, for all corporate business, and in terms of actual dollars, the profits from which a great part of growth money must come have been declining. From 1950 to the beginning of this year, the national income rose 43 per cent. The cost of compensation of employees, in actual dollars, went up 55 per cent —but corporate profits went down more than 5 per cent. Looked at another way, the share of the national income going into employee compensation increased from 64 to 70 per cent, while the share in corporate profits fell from 9 to 6 per cent."

Psychological Problem—The nation's economic progress has been so dramatic and consistent that "growth" has become the dominant word in the American economic vocabulary, Mr. Fairless declared. "This great consciousness of

AISI Technical Session Speakers

H. B. EMERICK
Jones & Laughlin Steel Corp.

V. W. WHITMER
Republic Steel Corp.

WALTER T. HAYTER
Youngstown Sheet & Tube Co.

J. M. STAPLETON
U.S. Steel Corp.

Two sessions at the AISI meeting were devoted to the discussion of technical subjects. (See photos of speakers above.)

First session:

Mr. Emerick, director, technical services at J&L, spoke on "Quench and Temper Process for the Manufacture of High Strength Tubular Products."

Mr. Whitmer, assistant chief metallurgist at Republic, discussed "Titanium: Production and Use."

Second session:

Mr. Hayter, process control metallurgist at Sheet & Tube, talked about "Process and Quality Control for Management."

Mr. Stapleton, assistant to vice president-steel operations at U.S. Steel, spoke on "Blast Furnace Error Proportioning."

The first meeting was presided over by E. R. Johnston, vice president-operations, Republic; and H. B. Jordan, executive vice president, U.S. Steel, was chairman of the second.

growth gives all our people a dynamic sense of direction," he stated.

However, he warned against a tendency to be "lulled" to the assumption that growth is automatic," adding: "If labor leadership assumes that industry and the economy will continue to grow indefinitely despite constant cost-price inflation, there is mounting danger ahead. If needed tax legislation is ignored in the belief that growth is inevitable regardless of the depreciation burden, industry's expansion can be greatly impaired."

Economic Research — C. M. White, chairman, Republic Steel Corp., urged that research in economics be encouraged to help eliminate "some of the guesswork and to try to make it a working science."

He said that the nation's economy has grown so rapidly that many policies and methods are outdated and that when the economic situation threatens to break down, "we merely prime it with spending programs and reinforce it with new laws. This is a dangerous situation, and I don't think there is any cheap and easy way out of it. We spend billions of dollars and millions of man-hours for research in physical sciences. Let's spend what it takes to understand the workings of our economy."

Improvement — Mr. White declared there has been improvement in understanding among the major segments of the country's economy. This, he explained, is "partly because the general education level is rising, partly because we in industry have exerted ourselves to make clear our objectives and partly because of the sheer impact of industry's achievements. But there is still a wide gulf of misunderstanding between management and organized labor, between industry and the public and between industry and government. I think this is the most serious challenge confronting us today.

"If the three great segments of our economy can understand each other, there is no domestic problem that cannot be solved, no reasonable goal that cannot be achieved."

Another Hazard — U.S. Steel's Roger M. Blough charged that a measure first introduced in the pre-

vious Congress by Rep. Wright Patman (Dem., Tex.) and currently known as H.R. 7 is a major hazard to America's future. The author, he stated, hoped that one of the results of the bill will be to force the voluntary dissolution of large corporations.

Mr. Blough declared that the "fragmentation tax" proposed by the bill is "one of the most plausible and most deceptively dangerous measures that has yet been aimed at our industrial system. And unless the American people can be fully informed of its hidden implications, its proponents may in time be able to build up a pressure for its passage."

Foreign Affairs—Max D. Howell, AISI executive vice president, said a recent institute development is the formation of a committee on foreign relations. It will give consideration to all matters of foreign trade that may be of interest to the industry.

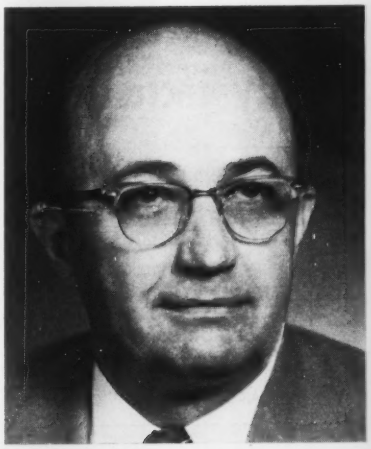
One of the new committee's first problems involves a request to train engineering graduates from India for the expansion of that country's steel industry.

The institute's committee on manufacturing problems, Mr. Howell said, has been discussing new processes, including the new fluid bed process for the reduction of iron and new basic oxygen process for producing steel. It also is considering major changes in the chemical and mechanical requirements of ship and aircraft steel.

Labor—F. H. Harbison, professor of economics and director, Industrial Relations Section, Princeton University, presented a paper, "Technical Manpower: Problems and Solutions," at the industrial relations session. It was presided over by John A. Stephens, vice president, U.S. Steel.

Atomics—The Charles M. Schwab Memorial Lecture was presented by Lewis L. Strauss, chairman, Atomic Energy Commission. The atomic energy industry, he said, expects to spend about $270 million this year on construction of civilian power and military reactors, as well as another $200 million on uranium mining and milling, some $33 million on instrument manufacture and perhaps $25 million on nuclear research, aside from power reactor study.

AISI Award Winners



A. F. MOHRI
Steel Co. of Canada

M. W. LIGHTNER
U.S. Steel Corp.

R. J. WILSON
Inland Steel Co.

C. M. SQUARCY
Inland Steel Co.

Five men received three awards at the AISI meeting, (see photos above). Two of the awards were given for the first time.

The institute medal was given to Mr. Mohri, chief metallurgist, Stelco, for his paper, "Metallurgical Aspects in the Design and Operation of a New Continuous Annealing Line."

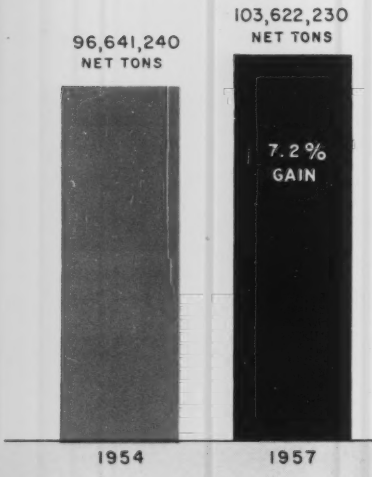
The new regional technical awards went to:

Messrs. Squarcy and Wilson, Inland, for their paper, "More Iron Without More Furnaces," presented in Chicago, Oct. 17, 1956. (Mr. Squarcy is Inland's manager of iron production and Mr. Wilson is assistant blast furnace superintendent.)

Messrs. Lightner and R. W. Vanderbeck (photo not shown) of U.S. Steel for their paper, "Factors Involved in Brittle Fracture," delivered in Pittsburgh, Nov. 28, 1956. (Mr. Lightner is U.S. Steel's vice president for applied research and Mr. Vanderbeck is chief research engineer, structural and plate.

How Steel Rolling Capacities Have Changed

Hot-Rolled Steel Capacity Increases 6,980,990 Tons



EIGHT LEADING HOT-ROLLED PRODUCTS	GAINS SINCE 1954	1957 CAPACITY
HOT-ROLLED SHEETS	2,025,125	33,529,170
MERCHANT BARS	148,630 LOSS	14,027,520
COILS FOR COLD-REDUCED BLACK AND TIN PLATE	2,583,400	9,285,300
PLATES	581,215	9,227,500
HEAVY STRUCTURAL SHAPES	2,063,130	7,628,400
WIRE RODS	373,475	7,374,850
SKELP	102,000	5,732,900
BLANKS, ROUNDS, BILLETS, FOR SEAMLESS TUBES	478,100	5,423,200

Capacities of Some Other Leading Products

NET TONS 1954-1957	COLD-FINISHED BARS	COLD-ROLLED SHEETS	GALVANIZED SHEETS	ELECTROLYTIC TIN PLATE	COLD-ROLLED STRIP	PLAIN WIRE
1957 CAPACITY	4,009,780	19,302,580	3,756,240	5,523,260	2,948,880	7,235,160
GAINS SINCE 1954	248,050	2,313,900	444,620	1,048,210	354,400 LOSS	453,480

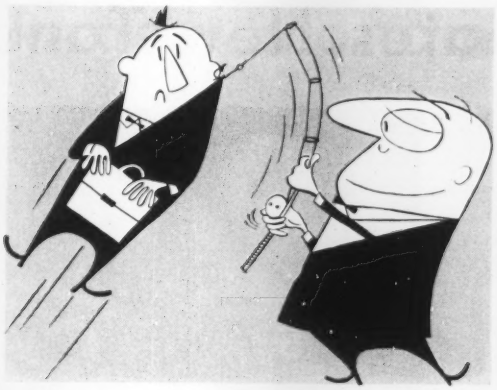
THE steel industry has increased its hot-rolling capacity in line with its expanding ability to produce ingots. This is shown in the 1957 *Directory of Iron & Steel Works of the United States and Canada.*

The directory, just off the press, is issued every three years by the American Iron & Steel Institute, New York.

The latest shows that the steel industry's hot-rolling capacity of 103,622,230 net tons is 77.6 per cent of the present ingot capacity of 133,459,150 tons. In 1954, the industry's hot-rolling capacity of 96,641,240 tons was equal to 77.7 per cent of the ingot capacity of 124,330,410 tons. (Capacity to produce hot-rolled products need not be as large as ingot capacity, because around 23 per cent of the steel in ingots becomes scrap in processing.)

While the over-all capacity for hot-rolling is up, the rise for all hot-rolled products has not been uniform. A reduction is noted for some, such as railroad products, strip and bars. Largest gain tonnagewise was made in capacity for coils for cold-reduced black plate and tin plate. Changes in capacity for some other products also are shown in the above chart.

Further details of capacities by products and by companies will be carried in a 16-page section in STEEL, June 3.



You'll fish a lot of holes before . . .

Landing the Top Executive

SUPPOSE you are about to have a vacancy in your top management echelon and no one in your organization can fill it. What do you do?

A medium sized manufacturer of metal products for the oil industry recently found itself in that position. Its president was near retirement age, but he hadn't groomed a successor.

A management consultant firm was hired to locate a likely prospect. But it was a tough uphill fight. The man finally selected came from the food processing industry, not another metalworking firm.

Switch—The problem of filling a gap in top management from the outside is being faced by more and more companies today. And it's pointing up one important fact: A man of proved administrative ability may well fit into the operation of a company quite foreign to his experience. This is particularly true of the "name" executives with broad contacts and associations.

A number of things explain the shortage of top-flight management men including: High business activity, continued industrial expansion, greater diversification of products and decentralization of operations. Many companies also fail to groom their own executive talent.

Future—The shortage of "upper division" executives will continue. The low birth rate of the 1930s and the upheaval in personnel resulting from World War II will leave their mark on industry for many years to come.

Where To Turn—Consultants are often the answer, but the American Management Association, New York, says business contacts are probably the most fertile field. Other sources named: Personal recommendations, advertising and commercial employment agencies. Unsolicited applications are rated last, though a few companies find them to be best.

Home Grown—Some companies don't find it necessary to go outside for top executive material. They prefer to "home grow" their own. An AMA survey shows 15 per cent of the companies reporting do little or no executive recruiting. Another 43 per cent fill up to one-tenth of their executive openings from the outside. The remainder (two companies out of five) recruit more than 10 per cent. The AMA observes the larger the company, the less likely it is to hire from the outside.

The thinking on hiring executives away from competitors or customers falls into two philosophies. Some companies regard it as unethical and will consider such an application only when the man approaches on his own. Others have no hesitancy about going after any likely prospect. To any charge of raiding or piracy, they reply that all men are free agents.

Some straddle the issue by turning to a consultant or recruiting specialist and having him do the negotiating.

Hawkshaws — Recruitment by management consultants is fast becoming big business.

The AMA survey found that two out of every five companies use consulting firms at one time or another. Medium sized firms are the best customers, small companies next. Large companies have less need for consultants, but a third of those surveyed do use them occasionally.

A disadvantage: Consultant firms are expensive. Those which do recruiting as part of an over-all service to a client usually have a per diem rate, plus expenses. The recruiting specialist generally charges a flat fee which often runs 10 to 20 per cent of the first year's base salary, plus expenses.

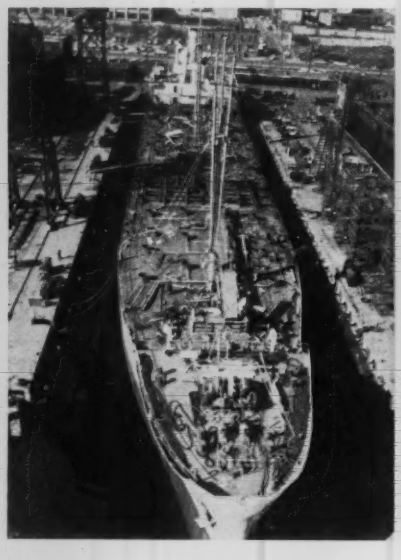
One Formula—Some consultants charge 20 per cent, plus expenses, or $2500, whichever is greater. If the recruiter's search is unsuccessful, or if the client appoints someone of his own selection, a per diem charge of about $125 is made.

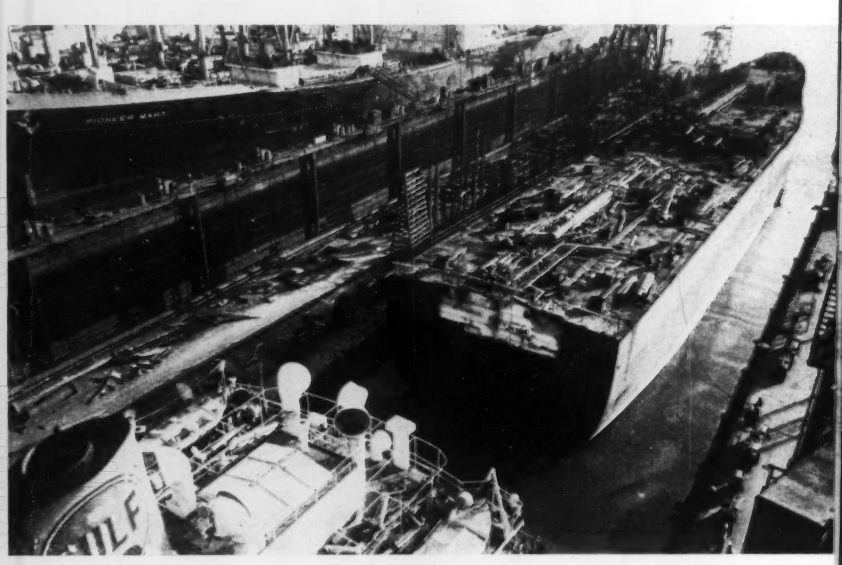
Consultants claim they are about 85 to 100 per cent successful in cases where the job remains open, though some personnel men believe this is a bit high. Cost is the principal disadvantage. Other complaints: Candidates are overrated; screening is inadequate; and the search takes too long.

Other Side—Clients, recruiters charge, could often expedite matters by providing more complete job specifications and by taking prompter action on the acceptability of a candidate. Excessive delay (often a matter of weeks) is usually unwarranted, recruiters say.

Some advantages of using consultants include: 1. Ability to sollicit men that clients can't otherwise reach. 2. Greater number of sources and personal contacts. 3. Ability to make a more thorough, confidential investigation. 4. Save client's time and trouble.

"Jumboizing" Creates New Tanker . . .





When stern is cut from midbody . . . it remains in dry dock as rest of tanker is floated out . . .

Gulf Oil Corp.'s T-2 tanker, *Gulfmeadows,* undergoes first step in a 36-day transformation that should give it 12 to 15 years more service.

"Jumboizing" of the *Gulfmeadows* took place at Bethlehem Steel Co.'s Key Highway shipyards in Baltimore. Gulf cites as reasons for the program: 1. The process insures a new and larger tanker at minimum cost. 2. The tanker can continue to carry cargo while the new midbody is being built. 3. The tanker is adaptable to harbors and coastal channels.

Dilemma in Furnaces

1956 saw largest business volume in industrial furnace history, but profits were low

THOUGH the industrial furnace industry enjoyed the largest volume of business in its history last year, it had one of its poorest years from a profit standpoint.

At a meeting at Hot Springs, Va., last week, members of the Industrial Heating Equipment Association were told that 29 companies with combined sales of $105.8 million in 1956 had a net income of only 2.7 per cent of sales. Only eight companies made over 5 per cent. (The average for all manufacturing is about 5 per cent.)

Aggravated—The profit picture in 1957 may be aggravated by a drop in sales 35 per cent below 1956's. In the first four months, sales were $28 million, compared with $38.2 million in the same 1956 period. Most of the decline came in fuel-fired processing furnaces. Electric furnace sales are running ahead of last year's.

Walter H. Holcroft, executive vice president, Holcroft & Co., Detroit, and IHEA president, says the furnace industry is too interested in getting individual orders and not interested enough in inflating costs.

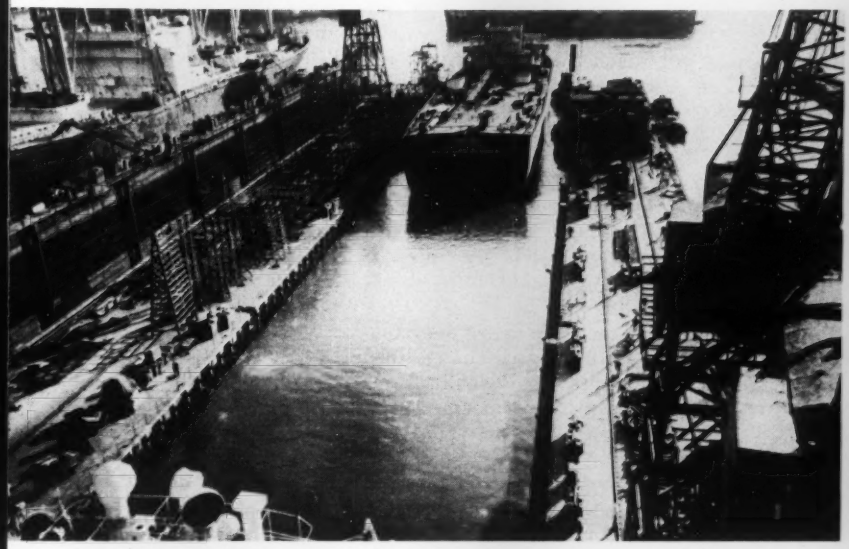
Reflects Costs — Mr. Holcroft pointed out that the steel industry once was notorious for its price cutting. Now, it is quick to reflect rises in material and labor costs in higher selling prices on steel products.

IHEA members, commenting privately, said the furnace industry in a sense has been reduced to the status of a contractor. Equipment specifications often are written by the purchasers but must be translated into working drawings by the suppliers.

Engineering Waste — This results in a waste of many engineering hours. As a countermeasure, some furnace builders are stepping up their research and development work on improved equipment and processes.

While 1957 sales are not measuring up to the all-time high of

It's Larger, Economical To Build . . .



then, new midbody (already welded to bow) is hooked to stern . . . and Gulf has a new tanker

The new, 354-ft midbody, to be welded to the bow and stern, will add 48 ft 6 in. to the over-all length of the tanker and 7 ft to its beam. The enlarged T-2 will be 572 ft long and 75 ft wide. The alteration will permit the tanker to carry an additional 30,000 barrels of fuel (such as gasoline). Fully loaded, it can carry more than 7 million gallons.

Enlargement completed, *Gulfmeadows* is renamed *Gulfbeaver*. The old midbody will be junked as bulk of Gulf's other T-2s will now come in to be "jumboized."

1956, this will still be one of the best volume years for the industry. Furnaces makers also look for a resumption of an uptrend in sales resulting from the projected expansion in steel, nonferrous metals and metalworking.

Trane Will Build in Tennessee

Trane Co., La Crosse, Wis., will build a $2-million plant at Clarksville, Tenn., for the production of central residential air conditioners.

Construction of the 130,000 sq-ft facility will implement a decision to enter the home market. In the past, the company has concentrated on the production of engineered-type units for hotels, factories, offices, theaters and other large buildings.

Zinc on More Steel

Weirton Steel official predicts higher sales for continuously produced coated sheets

LOOK FOR annual output of continuously produced zinc coated sheets to reach 4 million tons by late 1958, compared with 3 million tons now.

F. G. Brown, general manager of coated sheet products, Weirton Steel Co., Weirton, W. Va., made the prediction before the National Association of Sheet Metal Distributors at Philadelphia.

Potential—"Every factory, plant or shop is a potential user of zinc coated products if it makes an item that requires protection from corrosion," Mr. Brown declares. "In the automotive field, for example, almost all mufflers are made of zinc coated material, in addition to many miscellaneous parts, including head and tail light shells and retainers. One company has gone from hot and cold rolled sheets to zinc coated sheets for the entire window regulator system, which consists of 21 parts."

Two factors limit automotive applications: 1. Engineers are reluctant to make major changes on current models. 2. Zinc coated sheets cannot be welded at the required rate of 170 spots a minute. Mr. Brown anticipates solution of both problems by 1958.

He forecasts continued growth in household appliances, radio and television and stampings.

Air Force Hints Aircraft Shakeout

THE AIR FORCE still expects to spend $8.5 billion to $9 billion a year on air weapons through 1962, despite congressional tendencies toward budget cutting and the reduced volume of production it will demand from the aircraft industry (STEEL, May 20, p. 101).

Sour Notes—That's the only good news contained in latest AF releases on the future of the aircraft industry. The bad news: Subcontracting will tend to become less important in our air weapons planning; airframe makers may not move into electronics as extensively as has been expected; and not all the 12 big airframe manufacturers will be able to hold their current shares of the air weapons market during the next five years.

We are deeper into the transition from manned planes to missiles than many observers realize, point out high AF spokesmen who say: "The aircraft industry must prepare itself for major changes."

Weapons System—Aircraft industry people and subcontractors, particularly, have been slow to agree that our weapons system concept is the best way to build a modern thermonuclear war machine. Notes an AF spokesman: "1. We regard the problem of integrating the many components of an air weapon seriously. The AF doesn't have the facilities to do the job itself. We must rely on prime contractors to do it for us. This is especially true during the development stage of the job. 2. We can't force the primes to subcontract. About 40 per cent of the work on a B-52 and about 50 per cent of the work on an F-101 have been subcontracted: But this bubble will burst in six to eight months when we have passed our peak of air weapons production."

Airframe manufacturers will be hurt in the transition period. Their production of air weapons will fall from 6.5 million lb per month in 1958 to 2.5 million lb per month in 1962. Specialized manufacturers will suffer least. They have the personnel and facilities to carry through the AF program, which some of the airframe manufacturers don't have, says the AF. Advice to them: Get into other work as soon as possible.

No Concentration—Another hint: The AF doesn't think it wise to concentrate its future programs in one area. The California aircraft complex is singled out as an example of what AF doesn't want in the missile age. Decentralization is in order.

Publication of these views indicates that the AF has won the mobilization battle. The defense department is about to adopt the AF's conviction that the next war will be a quick one, with no need for huge mobilization. Say top AF people: "The decisive phase of the next war will be over in 30 to 90 days. We should discontinue the maintenance of a large mobilization base. No one can expect the aircraft industry, for example, to maintain 50 million sq ft of idle production space in 1962 for the next war. That space won't be needed."

Sums up one AF source: "We are about to go through a 180 degree change in our approach to the requirements of a mobilization base." Such a change has been hinted at since revision of Defense Mobilization Order VII-7 (STEEL, Mar. 25, p. 57).

Conclusion—The situation in the aircraft industry as the Pentagon sees it: 1. We have too many engine manufacturers. 2. The electronics folks have highly specialized skills which cannot be transferred to all 12 airframe companies to keep them going in the new missile age; three or four airframe companies will be enough to accomplish the AF programs.

Reaction—Industry sources generally take the AF pronouncements calmly. Typical: Baltimore's Martin Co., which has just begun production of the ICBM in a new Colorado plant. A Martin spokesman points out the aircraft industry won't be hurt so much as AF spokesmen indicate if Navy and Army missile development continues.

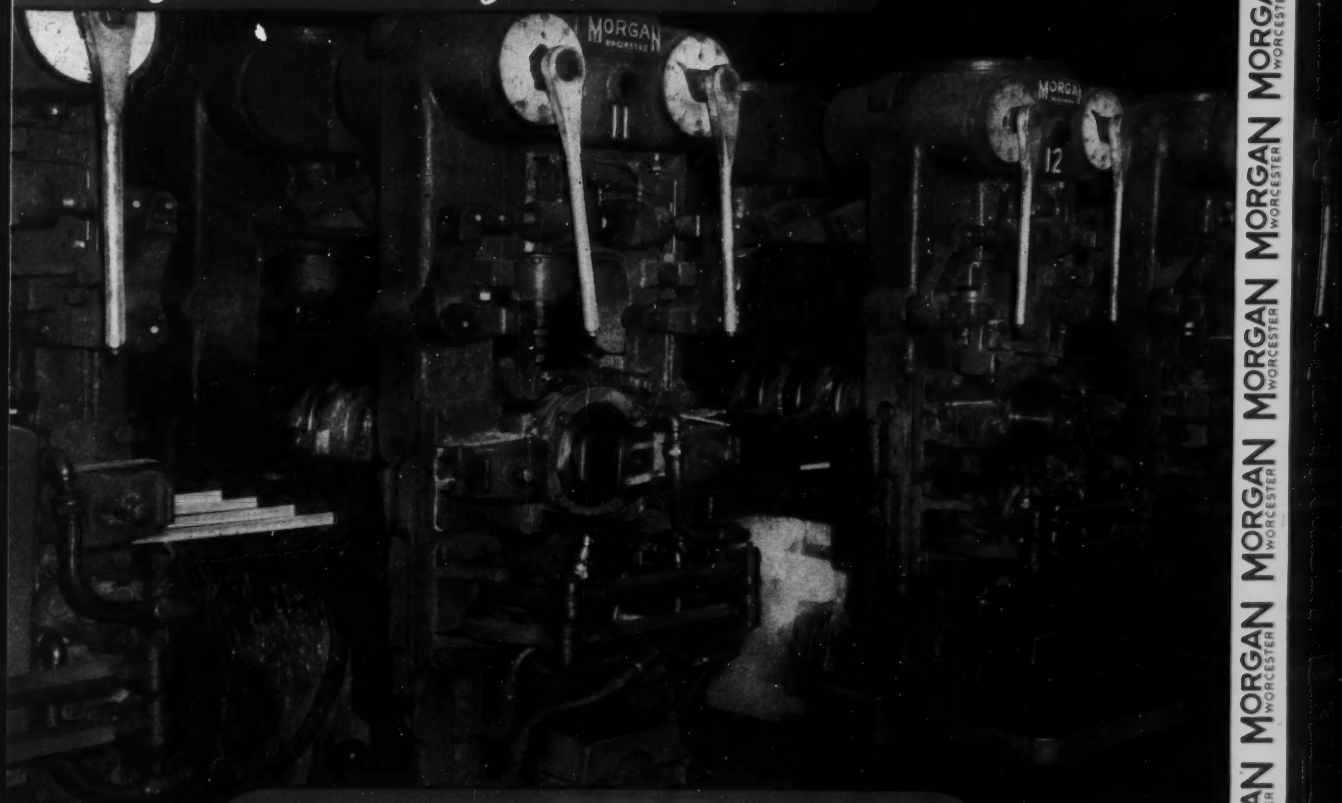
The Aircraft Industries Association says it has long recognized the seriousness of the situation but hasn't quite figured out what to do about it. Although there may be idle space now and more later, says an AIA spokesman, there is also a tremendous shortage of special manufacturing space for missiles. Says the AIA, too: "In some areas, civil aircraft production, maintenance and overhaul work are tending to fill the gap. As to the effect of declining AF volume on employment, AIA suggests that if dollar volume continues as high as in the past, the aircraft labor force may also remain constant. AIA concludes: The AF wouldn't publicize its production projections if it weren't worried about keeping the aircraft industry going during the transition period.

BDSA Faces Cutback

As many as 120 heads may roll at the Business & Defense Services Administration if its final appropriation is no larger than one approved by the Senate subcommittee ($1.4 million less than requested).

Horace B. McCoy, administrator, planned originally to revamp the agency by cutting 50 people from the payroll, insiders report.

Morgan Quality in Action



MORGAN WORCESTER

High Speed Four Strand Rod Mill

Cuyahoga Works, American Steel and Wire Division

UNITED STATES STEEL CORPORATION

Morgan Mills are known to steel men throughout the world for their sound design and accurate manufacture . . . an enviable reputation which has assured mill users of efficient and trouble-free operation. Morgan Mills have kept pace with the ever-increasing demands for high output and greater accuracy of product.

MORGAN CONSTRUCTION CO.

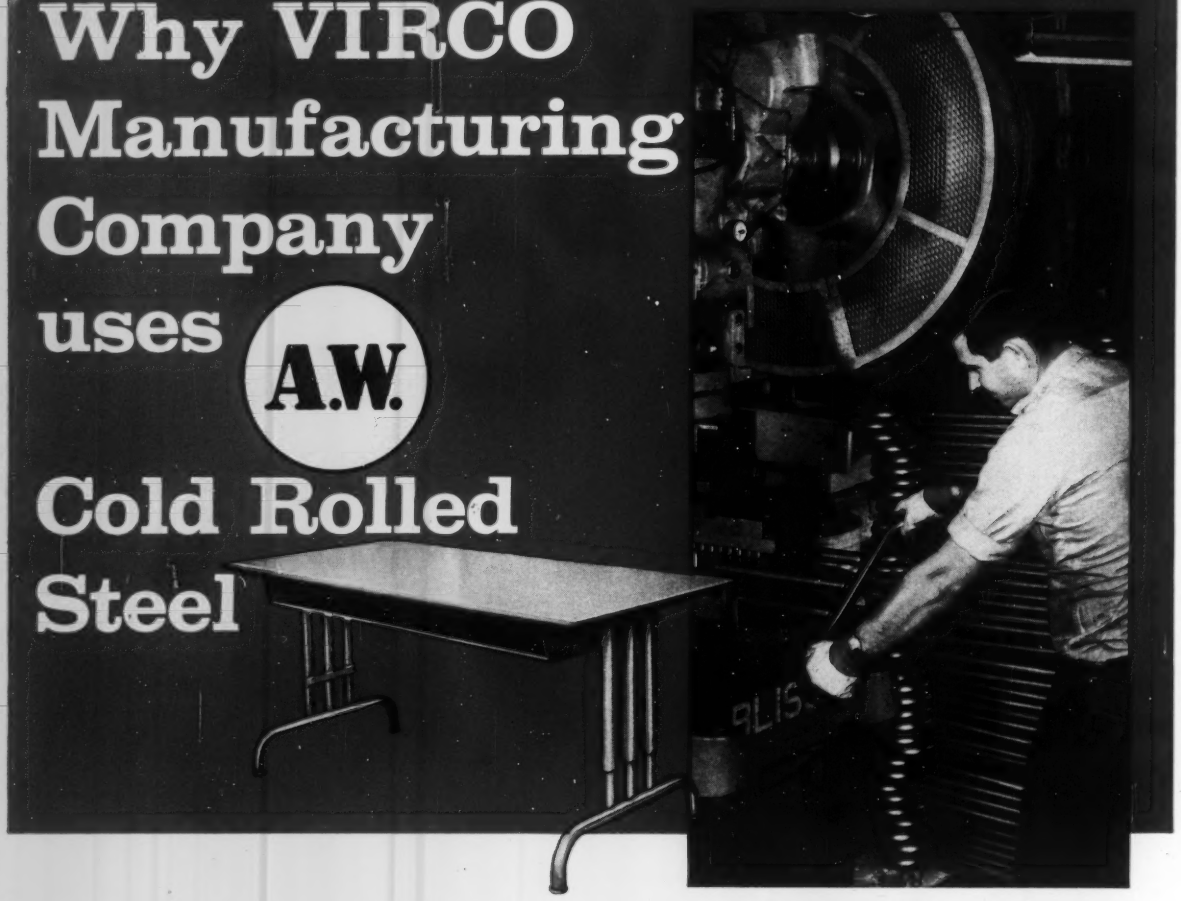
WORCESTER, MASSACHUSETTS

ROLLING MILLS MORGOIL BEARINGS GAS PRODUCERS
WIRE MILLS EJECTORS REGENERATIVE FURNACE CONTROL

RM-70

MORGAN WORCESTER

Why VIRCO Manufacturing Company uses A.W. Cold Rolled Steel



At Virco, a high-quality steel for tubing *must* be ordered!

At Alan Wood, a high quality steel *is* produced.

Alan Wood's own metallurgists investigate customer needs . . . then control the quality of the steel throughout their fully integrated production process—from mine to mill to market. Each customer receives the right steel for his product. As a result, down time and rejects due to poor steel quality are reduced, production increased . . . profits improved!

If fabrication of your product demands high-quality steel plus service, investigate the advantages of steel produced by Alan Wood. Write Marketing Division, Dept. CR-S70 today.

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"Swede" pig iron

STEEL PRODUCTS
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A.W. Dynalloy (high strength steel)
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Hot rolled strip
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Cold rolled strip

ROLLED STEEL FLOOR PLATE
A.W. ALGRIP *abrasive*
A.W. SUPER-DIAMOND *pattern*

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COKE
Foundry, industrial & metallurgical

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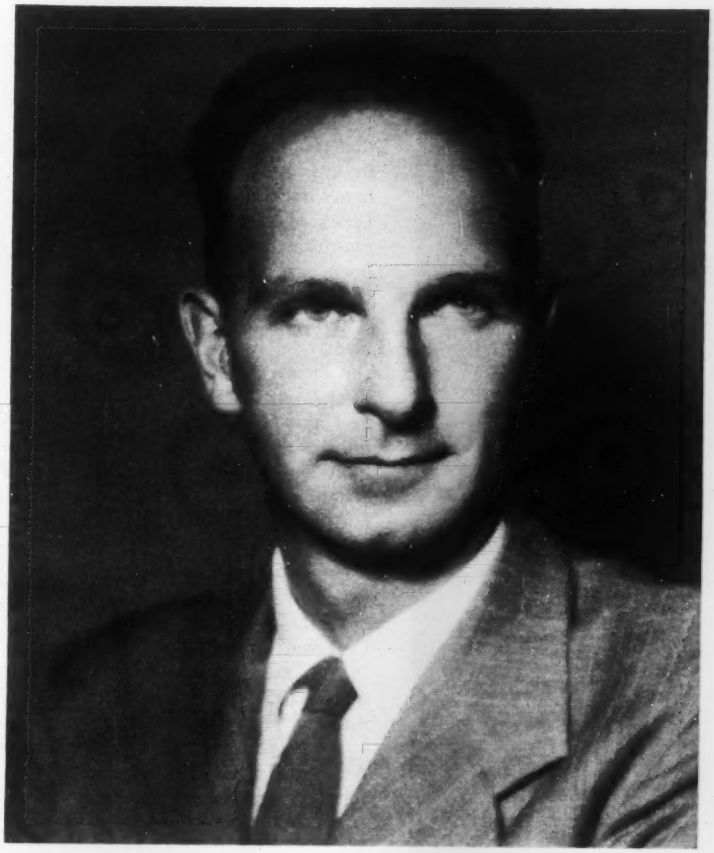


Kurt Orban visits Europe, Australia and Japan, finds . . .

Free World Steel Booming

"CURRENT DEMAND for European steel products is high," says Kurt Orban, president, Kurt Orban Co. Inc., New York.

Just back from a trip to Europe, Australia and Japan, this importer of steel, machine tool and metalworking equipment told STEEL: "European mills are booked in about everything." Welded gas and water pipe and nails are being overproduced.

Plates—Premium priced ship plates sold for about $210 per metric ton in foreign markets until a few weeks ago. The recent availability of American plates at U.S. mill prices has reduced the quotation to about $160 per metric ton. "Most European shipyards have a three-year order backlog," explains Mr. Orban, "and they have most of the plate mills booked ahead for at least 12 months."

A growing trend toward an information exchange with the U.S. is leading to cross-licensing arrangements.

Says Mr. Orban: "A number of steelmakers in Europe are taking the attitude that they should view the U.S. market as a good place to sell reasonable tonnages at stable prices rather than as an outlet for temporary surpluses."

A country-by-country rundown of areas visited by Mr. Orban shows:

Germany: Steelmakers are working at 100 per cent of capacity. Domestic prices are generally lower than export quotations. Sheet and strip shipments to the automotive industry are holding at high levels. Additional amounts are going for tin plate, steel barrels and drums, office machinery. Residential and industrial construction is keeping the demand for structurals strong. Plate demand is excellent. (Some plate mills have down payments on next year's production.) Wire mills are selling everything they can produce.

France: Drawn wire activity is high. Owing to commitments in North Africa, most barbed wire production has been taken from the market. The European price on barbed wire has increased from about $138 to $160 per metric ton. Seamless tubulars, structurals and plates are tight. Welded pipe is easy to get. Automotive demand for steel is up. Demand for rerolling materials—slabs, billets, tube rounds—is growing in France and other countries.

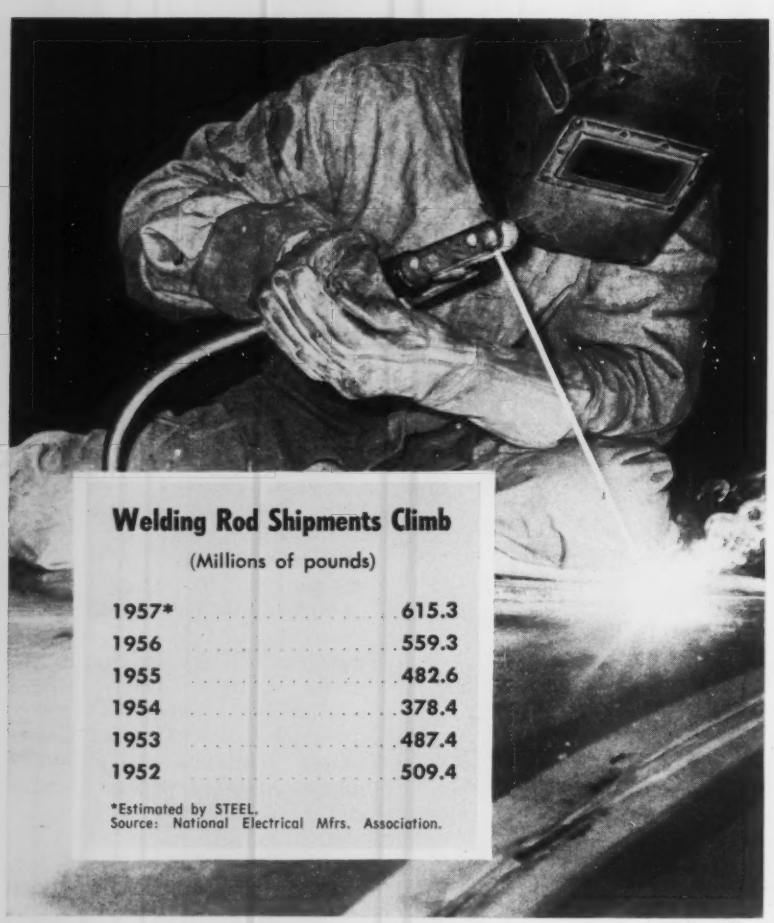
Belgium: Structurals and plates are in tight supply. This country has been affected by the looseness in the American market because it exports 60 to 70 per cent of its production. Business with the six countries of the coal-steel community and Japan has taken up part of the slack. Merchant pipe is loose.

Japan: Basic steel is running at capacity. This country is importing coils, pig iron, semifinished steel and some plates. It is conducting intensive explorations for raw materials in other countries.

Australia: It is producing at about 100 per cent of capacity but is not primarily interested in foreign markets.

Steelmaking costs are the lowest in the world because ore mines are close to steelmaking facilities and transportation is cheap.

Observations—1. Importing coal and scrap has become a way of life with Europeans, says Mr. Orban. 2. The electric furnace is being used only for alloying and fine production work because of high power requirements. 3. The use of atomic power to produce steel is still some years away.



Welding Rod Shipments Climb

(Millions of pounds)

1957*	615.3
1956	559.3
1955	482.6
1954	378.4
1953	487.4
1952	509.4

*Estimated by STEEL.
Source: National Electrical Mfrs. Association.

U.S. Steel Corp.

Good Year for Electrodes

Mild steel accounts for about 76 per cent of shipments as welding rod sales continue upward spiral. Drop in defense uses is minor factor in '57 outlook

WELDING electrode shipments will rise about 10 per cent to an estimated 615.3 million lb this year. It will be the fourth straight year they have climbed (see table). Major reasons: 1. Increasing output by volume welding rod buyers. 2. Greater use of welding by some industries. 3. Incorporation of welding into new processes.

Money — Most manufacturers contacted by STEEL also expect dollar sales to go up this year. A medium sized manufacturer reports his sales in 1954 were $600,000; 1955, $700,000; 1956, $900,000. His prediction for 1957: $1.2 million.

It's not possible to obtain specific figures for the types of electrodes shipped by each of the 23 welding rod manufacturers. But percentagewise, shipments fall into these general patterns: Mild steel heads the list with 76 per cent of the shipments, followed by stainless steel (10 per cent), low alloy steel (6 per cent), automatic wire (5 per cent) and nonferrous (3 per cent).

Customers—Major customer industries are not the same for each manufacturer. Reasons: 1. Some firms specialize and don't make all types of electrodes. 2. Individual manufacturers have traditionally been stronger in some industries than others.

Industrywise though, the biggest electrode users are auto makers, the construction industry, pressure vessel makers, shipbuilders, oil and gas line fabricators and refineries. The medium sized group includes railroads, machine tools, other machinery and equipment, maintenance. Smaller (though important) users are included in these categories: Appliances, steel fabricators, atomics, defense.

Switch—An important change: Defense, one of the big customers in the past, is not too important in the 1957 outlook. Estimates of makers peg defense shipments at 1 to 10 per cent of total volume. Average is about 4 per cent. Defense spending is shifting away from big users, such as combat tank fabricators, toward aircraft and missiles.

Outlook—Manufacturers are enthusiastic about the potential for welding rods. Charles Herbruck, Lincoln Electric Co., Cleveland, thinks these markets have vast possibilities:

- Bridges: The trend toward welded construction is increasing. (About 26 states use it.) One advantage: The designs require less steel.
- Machinery: Potential is an additional 12 million lb market for weldments.
- Aluminum products: Welded aluminum building materials, small boats and marine engine blocks are coming to the front. Kaiser Aluminum Co.'s cranes at its new Ravenswood, W. Va., plate and foil rolling mill are welded aluminum (see STEEL, Jan. 14, p. 88).
- Autos: Unitized construction could be a big boost to the industry. The trend to automatic CO_2 welding has already had its effect on the market.
- Home: The do-it-yourself market has hardly been tapped. Main-

tenance work on farms, industrial plants and office buildings is another market with potential.

• Buildings: Welded structures are becoming more common—48 of the last 50 buildings erected in Texas have been welded.

Simon A. Greenberg, American Welding Society, New York, sums up welding's status this way: "It is not finding new uses so much as it is expanding existing ones. Pressures vessels used to be riveted—today they're welded. Welded construction is becoming more common. New electrodes are being developed to expand markets."

Stimulant — Iron powder electrodes continue to boost welding rod sales. Say officials of the Buffalo Welding Department, Westinghouse Electric Corp., Buffalo: "There is a general, but definite, trend toward use of powdered iron electrodes and away from electrodes of the 60-20 or 60-10 types. Powdered iron electrodes are easier to work with and faster."

Coated electrodes also come in for praise from J. H. Humberstone, president of Air Reduction Sales Co., New York: "From the standpoint of simplicity and flexibility, the coated electrode is unsurpassed.

"Further, the capital cost of equipment involved in the application of this process is low, compared with that of the other commonly used arc welding processes. The future for electrodes is definitely bright, and higher speeds than ever before can be expected."

Stainless — Some stainless steel manufacturers report a dropoff of stabilized materials (columbium-bearing alloys) in favor of extra low carbon grades. A midwestern maker reports an increase in use of bare stainless and alloy wire.

C. R. Miller, McKay Co., Pittsburgh, sums up the stainless outlook this way: "Sales will be firm, and low-alloy requirements should increase this year. Shipbuilding and atomic users are leaders in our outlook for 1957. Both industries should continue to expand."

Factor—Users are closely controlling their electrode inventories and are depending on tighter scheduling of deliveries. The situation is putting new emphasis on hard selling in an industry that is highly competitive by tradition.

Steel on a Shoestring

Former Follansbee officials form Mill Strip Products and prove that a new nonintegrated steel producer can succeed. It operates as independent subsidiary of Korhumel

CAN a small company break into the steel business as an independent producer?

Mill Strip Products Co., Evanston, Ill., answers "yes." It has two years' experience to support the claim.

Nonintegrated — John Stoutenburg, executive vice president, points out: "When we say independent, we mean nonintegrated. Believe me, our toughest job has been to convince customers we can deliver quality products at mill prices."

The company started from the desire of William M. Bausch and Mr. Stoutenburg to get into business for themselves following the sale of Follansbee Steel Corp., Follansbee, W. Va. Mr. Bausch had been Follansbee's sales vice president and Mr. Stoutenburg the company's Detroit district sales manager.

Aims—"We didn't have enough money to buy, lease or rent our own mill facilities. On the other hand, we didn't want to go into straight warehouse operations. Our former customers and our integrity were our biggest assets. We knew they wouldn't stick unless we operated independently," explains Mr. Stoutenburg.

The men decided to compromise. They looked around for an outfit with extra mill facilities. Korhumel Steel & Aluminum Co., Evanston, had what they wanted.

Facilities—Korhumel was operating as a warehouse, but it had a cold rolling mill (4 stand, 18 in.), a tandem temper mill (2 stand, 18 in.), six annealing furnaces and finishing equipment. Since it rolled only 5000 or 6000 tons of steel annually, the facilities were idle part of the time.

Messrs. Bausch and Stoutenburg acquired full operating rights to the equipment by giving Korhumel cash and access to customers they had developed.

In February, 1955, Mill Strip was incorporated as a subsidiary of Korhumel. N. F. Korhumel was elected chairman and Mr. Bausch president. Under this setup, the company operates independently. If it has free capacity, it may roll specialty grades for the warehouse on a customer basis. (In two years, this phase has accounted for about 8500 tons, much of it in '55.)

Expansion—Last year, the firm added two Steckel mills and four more annealing furnaces. Soon it will install more finishing equipment and another temper mill. Products include cold rolled, low carbon strip, cold rolled spring steels (annealed), electrogalvanized strip and specialty strip.

Moving into its third year, Mill Strip quotes mill prices and seems confident that sales will equal or exceed 1956 figures.

Mill Strip's Sales

(In tons)

1957*	14,700
1956	14,500
1955	17,150

*Estimated.

MonoRail To Expand Plant

American MonoRail Co. will spend $1 million to expand production facilities at its W. 150th St. plant, Cleveland.

Scheduled for completion in 1958, the 85,000 sq-ft addition will permit consolidation of all manufacturing operations at one location. The company makes cranes, monorails, conveyors and other material handling equipment.

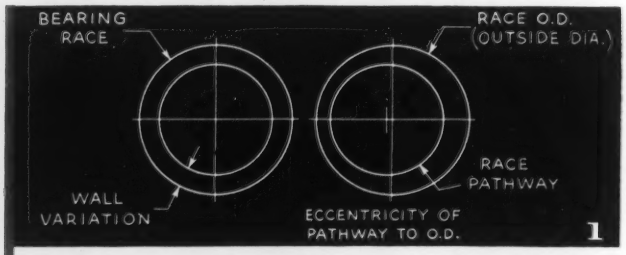
ONE OF A SERIES . . .

What makes a Hyatt roller bearing good?

CLOSE CONTROL OF INTERNAL DIMENSIONS and CLEARANCES

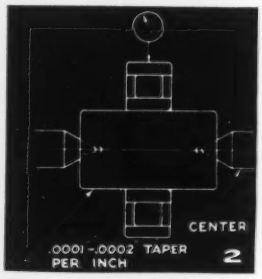
The running accuracy and smoothness of a HYATT roller bearing is governed by the tolerances of its internal dimensions and its internal clearance. Internal dimensions include concentricity of race diameters, uniformity of roller diameters and squareness of all radial and axial surfaces.

Because the internal dimensions of HYATT Hy-Roll bearings are so closely controlled, HYATTS run smoothly and quietly, last longer, and prevent equipment trouble due to excessive heat and vibration. You will find full selection and application data in HYATT General Catalog 150, or call your nearest HYATT Sales Engineer. HYATT Bearings Division, General Motors Corporation, Harrison, New Jersey. Sales offices at Harrison, New Jersey; Pittsburgh, Pennsylvania; Detroit, Michigan; Chicago, Illinois; and Oakland, California.



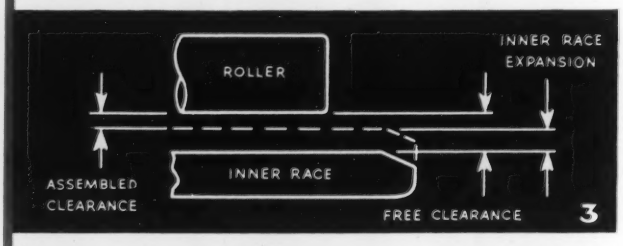
CONCENTRICITY OF RACE DIAMETERS

Concentricity of race diameters is usually defined in terms of wall variation, Figure 1, of the individual races, and radial run-out of the assembled bearing. The latter is generally a user's inspection where the bearing is mounted on an arbor, Figure 2, having a slight taper (.0001″ to .0002″ on the diameter per inch of length) and the radial run-out indicated as shown by turning either the arbor or the outer race one revolution while the other member is held stationary and noting the difference between the minimum and maximum readings. Industry standards are available which indicate what values are acceptable.



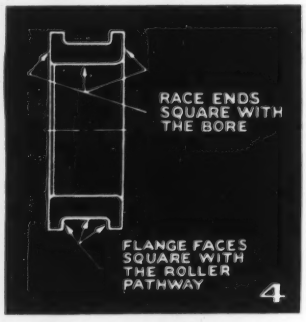
UNIFORMITY OF ROLLER DIAMETERS

Roller diameter uniformity, which is also necessary to running smoothness, is obtained by segregating the rollers into diameter variation classes of .00005″, .0001″ or .00015″, depending on bearing size and quality grade and assembling only rollers of the same class into a given bearing. Rollers are then matched with races which are segregated in a similar manner in order to control the diameter over or under the rollers, which governs the internal clearance spread of the mounted bearing. Figure 3 (magnified)



SQUARENESS OF RACE AND ROLLER ENDS AND FLANGE FACES

Figure 4 indicates the race surfaces which must be square with each other within minute tolerances depending on the grade of the bearing. This is to prevent roller skewing with consequent heating and noisy operation. The roller ends must also be square with the diameter for the same reason. End square tolerances are usually less than .001″ for the most frequently used sizes.



GM GENERAL MOTORS

HYATT HY-ROLL BEARINGS FOR MODERN INDUSTRY

Trend Rises in Used Car Prices

(Average auction prices on all models up to eight years old)

*Estimated by STEEL.

Old Models in New Demand

USED CAR SALES may take up the slack created by the disappearance of the spring market for new models (STEEL, Apr. 29, p. 135).

No distinct pattern has developed, but if this is the trend, it will help spread new model sales throughout the year. This makes for changes in auto makers' material purchasing patterns.

Indicator—Some hint as to what's happening is seen in the chart above. Used car prices are highest in late fall when the next year's models appear in auto auctions.

Prices decline through the year as depreciation takes its toll. The industry rule of thumb is to figure car depreciation at the rate of $10 a month for each $400 unit in a car's price. Although this price trend doesn't fluctuate with sales, strong market demand does tend to level out the decline.

Patterns—Used cars traditionally move best in summer months when prices are lowest and new model sales are slow. Last year, however, saw an upswing in second-hand sales earlier in the season. As a result, prices leveled off during the spring.

This year, the pattern seems to be repeating. About 2 million used autos changed hands in March and April. That's just a few percentage points below 1956's record figures for these months. Continued high volume is forecast for May and June, with totals somewhat lower than they were in the previous 60 days.

Big Push — Franchised dealers (they handle 65 per cent of used car marketing) are putting on a strong bid to move the older models.

Used car inventories are slightly above the normal 30-day level. If

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dealers can knock this down to 26 or 27 days during the next month, they'll clear the way for higher 1957 model sales during the third quarter.

Increases—Car prices went up an average of $100 this year. Automatic cost of living increases for auto workers are expected to boost '58 prices $30 to $60. Best indications are the auto companies will pass any increased costs on to the consumer.

If this happens, it will take a tremendous loosening of credit terms to put a marginal prospect in a '58 model. If credit is unavailable, he may turn to a used car. This could keep 1958 sales and production well below the 7 million mark some optimists are forecasting.

Big Volume—Few persons outside the industry realize that more used than new cars are marketed each year. The ratio varies from 2 to 1.5 to 1. In 1955, 9.3 million used cars were bought by individuals and dealers. The 1956 figures aren't available, but it's estimated that second-hand sales ran close to 9 million units. This year should at least equal the 1956 mark.

One and two-year-old models are the hottest sellers. Right now, '55 cars are moving fastest. Their average price is about $1200.

Imports — Dealers are closely watching the growth of the foreign car market. Some 14,990 foreign jobs were registered during March, compared with 6627 in March, 1956. Estimates for April and May indicate this ratio will continue.

The National Independent Automobile Dealers Association (NIADA) believes foreign car sales won't kill off the second-hand market no matter how many imports are registered. But an expanding small car market will lower used car prices.

Looking?—If you'd like to pick up an older model to use as a second car, a few hints from Detroit's Livernois avenue (called the world's used car capital) might keep you from buying a lemon.

The advertised price on a used car is roughly $250 above its wholesale or auction price. Dealers aim at $100 to $125 net profit, although they'll settle for $75 or less when the market is tight.

Condition—Here are some points any layman can check:

- Unmatched or recapped tires mean high mileage.
- Many "almost new" tires with a lot of tread also may have a boot inside the casing. Have the tire pulled if you're suspicious.
- Extra heavy oil in the crankcase can conceal worn pistons and rings.
- Hammer marks, wavy sheet metal and poorly matched paint indicate body damage that has been repaired.

To be really positive, the dealers suggest you have the car inspected by a mechanic you know and trust. One peddler says: "If a dealer has nothing to hide, he'll be happy if you do have the car checked."

Chrysler Steps Up Output

Chrysler Corp. is trying to make up for lost time after its costly labor troubles with the UAW.

The firm is scheduling six-day operations in most of its Detroit plant and in Los Angeles. The goal: 355,000 cars for the quarter. Although it's running about 12 per cent behind schedule, chances are good that lost ground can be made up. A production pickup is a must this year because the firm can sell almost any car it builds.

Chrysler dropped its $5 million breach of contract suit against UAW Local 212, which was filed when workers refused to move dies to the company's Twinsburg, O., stamping plant. Restored to the payroll were 15 men previously fired or suspended because they wouldn't move equipment.

The company will offer transfer rights to salaried people who might be displaced by the move to Ohio. This concession will make for future UAW talk about the need for representation of white-collar workers.

Other grievances are being ironed out now. One of Chrysler's industrial relations men says: "I think we've actually reached a point where we can bargain with the union instead of just giving in."

That may be true in this case, but nobody is quite convinced the peace will last.

U.S. Auto Output

Passenger Only

	1957	1956
January	642,089	612,078
February	571,098	555,596
March	578,826	575,260
April	549,239	547,617
4 Mo. Total	2,341,252	2,290,551
May		471,617
June		430,373
July		448,876
August		402,575
September		190,726
October		389,061
November		581,803
December		597,226
Total		5,802,808

Week Ended	1957	1956
Apr. 20	118,327	129,826
Apr. 27	123,633	127,189
May 4	119,999	112,705
May 11	125,924	105,552
May 18	127,304†	105,763
May 25	127,000*	108,230

Source: *Ward's Automotive Reports.* †Preliminary. *Estimated by STEEL.

Market for New Hawk?

Some skepticism has developed concerning Studebaker-Packard Corp.'s ability to sell the Packard Hawk it will introduce in November. The question: Will it differ sufficiently from the Studebaker Hawk to warrant production? Having the Studebaker's chassis and rear quarters, is must rely on a sloping hood and small grille for individuality. The features remind one of the Mercedes-Benz 300-SL. S-P will distribute the Mercedes-Benz line also.

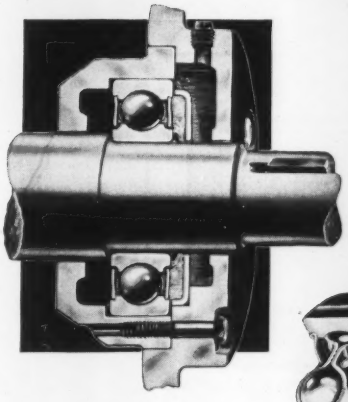
Aside from this, the industry agrees the company is making the right moves. It will offer its economy Champion Scotsman line June 1. The three models (two door, four door and two door station wagon) carry factory list prices of $1776 to $1995. This is about $200 less than the lowest priced Big Three models. Similar in most respects to the old Studebaker Champion, the Scotsman weighs 100 lb less and is stripped of most chrome and other trim. H. E. Churchill, S-P president, hopes the 6-cylinder car will attain a gas economy of 29 mpg. Heater, defroster and turn signals are standard equipment.

FACTS

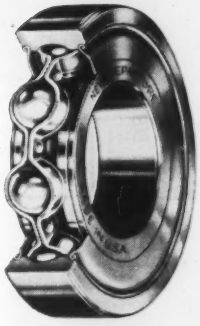
about

NEW DEPARTURE BALL BEARINGS

Photo: Courtesy of Reliance Electric and Engineering Company



Metering plate adjacent to bearing prevents overlubrication. Excessive grease pressure is relieved *outwards* around shaft. No grease can be forced into motor.



Right: Shielded ball bearing always retains adequate grease supply.

Driving a car shaker is like riding a bucking bronco—and the motor and bearings that do the job have *got to be* tops in every detail for such rugged service.

But even under these rough, tough load conditions, high capacity New Departure ball bearings assure exact rotor location—full electrical and mechanical motor efficiency.

An important feature of the bearing mountings is the use of a "metering plate" which regulates grease flow and prevents excessive grease pressure against the bearings. They cannot be under- or over-lubricated. Yes, motor and bearings are built to maintain precision at operating extremes.

Such motors are safe for long periods without attention—the bearings are fully protected from dirt and there is no grease leakage into the windings. Write for details on New Departure shielded ball bearings.

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BALL BEARINGS MAKE GOOD PRODUCTS BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

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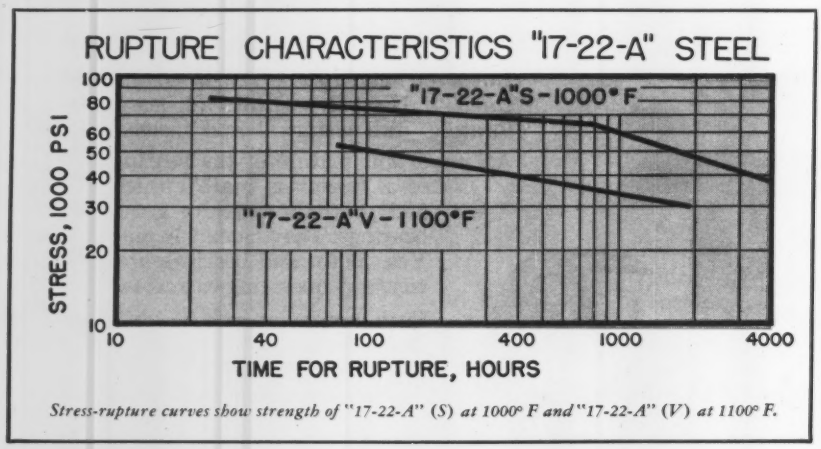
USE "17-22-A" STEELS

Contain less than 3% alloy... give maximum strength to 1000° and 1100° F

YOU don't have to use an expensive high alloy steel for gas turbine or other parts that operate up to 1000° and 1100° F. You can use "17-22-A" steels made by the Timken Company—*low* alloy steels—to do the same jobs. They give *high* alloy performance, save critical alloys, cut costs. They contain less than 3% alloy, yet they give maximum strength up to 1000° and 1100° F.

You get more advantages. "17-22-A" steels resist heat checking and thermal cracking. They are readily workable up to 2300° F. They are easily machined and welded. And maximum high temperature properties can be developed by normalizing and tempering, minimizing the possibility of distortion and quench cracking.

Send for complete information on "17-22-A" (S) steel, and its companion analysis, "17-22-A" (V), recommended for temperatures up to 1100° F. Ask for Technical Bulletin 36A. And call upon our technical staff for help with your high temperature steel problems. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO".

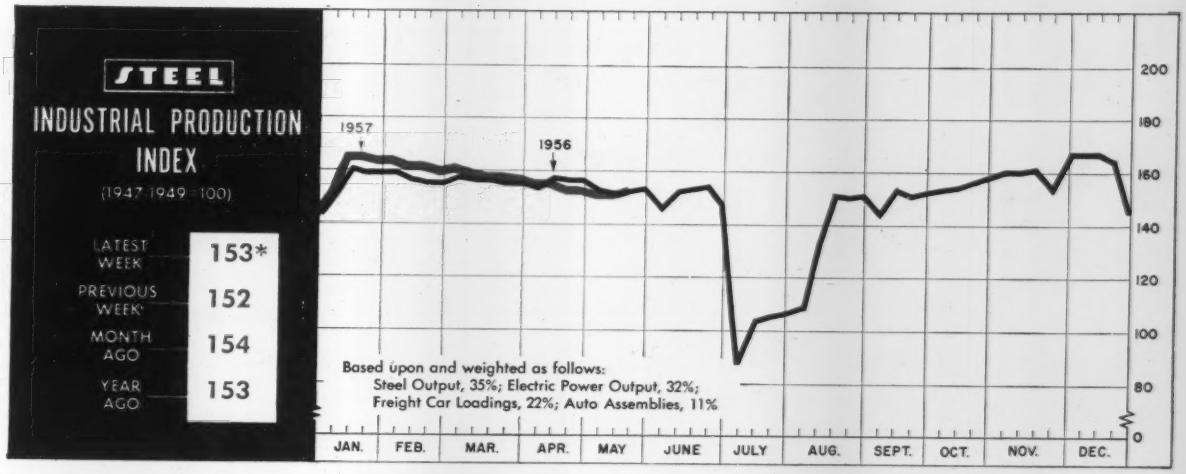


Stress-rupture curves show strength of "17-22-A" (S) at 1000° F and "17-22-A" (V) at 1100° F.

TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING



*Week ended May 18.

Production: Signs Point to Another 1956

INDUSTRIAL production this year is following the pattern set last year with two notable exceptions: 1. Trend lines for the most part have held significantly above 1956 levels. 2. Last year, production was buoyed by steady increases in new orders; the level this year is being maintained by huge backlogs as new orders taper off.

The Federal Reserve Board's industrial production index finally broke its string of 146s (1947-1949 =100) in April, slipping to 145. The decline was not unexpected. The history of this index indicates that when a strong uptrend is lacking in the spring, seasonal factors push production down a bit. It is certainly too early to attach any significance to this dip because the index is still 2 points above the year-ago reading and only 2 points below the all-time high of last December. A further seasonal weakening to 144 is indicated for May, still 3 points above the year-ago level. The similarity of the two patterns is even more clearly evident in STEEL's production index (above).

Still Adjusting — The fact that the primary metals index dropped farther below the 1956 level in April (134 vs. 146) while the metal fabricating figure remained well above the year-ago mark (177 vs. 170) indicates that metalworking companies are still working off huge inventories of raw materials they built up last year. Most economists feel this adjustment is nearly at its end and that production will match consumption during the rest of 1957.

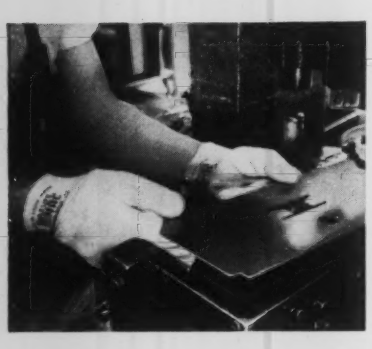
The apparent dip in new orders is not as severe as it seems when taken on a year-to-year basis. The latest figures show that orders in March (seasonally adjusted) were down about 5.5 per cent from the high of $29.4 billion in November. But at $27.8 billion, they were still 3.4 per cent above the March, 1956, figure. Allowing for inflation, this probably represents about equal

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,220[1]	2,155	2,396
Electric Power Distributed (million kw-hr)	11,250[1]	11,311	10,875
Bituminous Coal Output (1000 tons)	9,650[1]	9,620	9,850
Petroleum Production (daily avg—1000 bbl)	7,400[1]	7,434	7,071
Construction Volume (*ENR*—millions)	$357.7	$385.2	$300.2
Auto, Truck Output, U. S., Canada (*Ward's*)	163,149[1]	160,101	140,963
TRADE			
Freight Car Loadings (1000 cars)	725[1]	723	779
Business Failures (Dun & Bradstreet)	267	297	258
Currency in Circulation (millions)[3]	$30,654	$30,589	$30,359
Dept. Store Sales (changes from year ago)[3]	+3%	+6%	+19%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$20,762	$22,506	$21,685
Federal Gross Debt (billions)	$273.3[1]	$273.7	$275.7
Bond Volume, NYSE (millions)	$19.1	$19.9	$21.1
Stocks Sales, NYSE (thousands of shares)	13,086	12,068	11,149
Loans and Investments (billions)[4]	$86.1	$87.1	$84.9
U. S. Govt. Obligations Held (billions)[4]	$25.6	$26.0	$26.9
PRICES			
STEEL's Finished Steel Price Index[5]	228.59	228.59	210.45
STEEL's Nonferrous Metal Price Index[6]	231.4	232.8	276.9
All Commodities[7]	117.2	117.2	114.3
Commodities Other Than Farm & Foods[7]	125.3	125.4	121.8

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1957, 2,559,490; 1956, 2,461,893. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100.

GLOVE COSTS too high?



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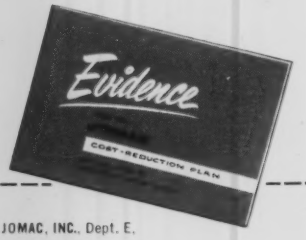

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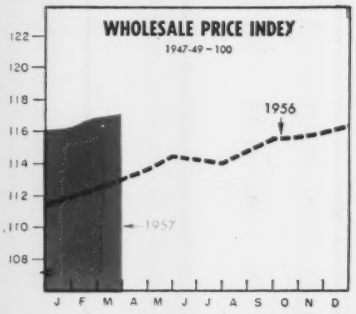
THE BUSINESS TREND



	All Commodities 1957	All Commodities 1956	Other Than Farm & Foods 1957	Other Than Farm & Foods 1956
Jan.	116.9	111.9	125.2	120.4
Feb.	117.0	112.4	125.5	120.6
Mar.	116.9	112.8	125.4	121.0
Apr.	117.2	113.6	125.3	121.6
May	....	114.4	....	121.7
June	....	114.2	....	121.5
July	....	114.0	....	121.4
Aug.	....	114.7	....	122.5
Sept.	....	115.5	....	123.1
Oct.	....	115.6	....	123.6
Nov.	....	115.9	....	124.2
Dec.	....	116.2	....	124.6

U.S. Bureau of Labor Statistics.

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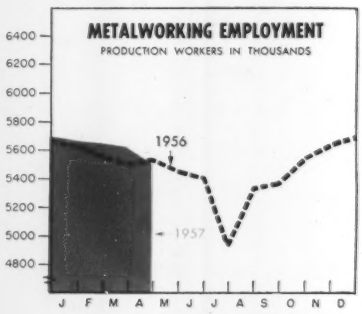


1956	Prim. Mtls.	Fab. Prod.	Mach- inery	Elec. Mchy.	Trans. Equip.
Apr.	1,136	895	1,292	874	1,332
May	1,117	881	1,281	872	1,295
June	1,118	870	1,278	866	1,269
July	743	825	1,254	854	1,250
Aug.	1,091	864	1,257	878	1,235
Sept.	1,126	885	1,262	891	1,205
Oct.	1,132	911	1,264	914	1,319
Nov.	1,132	911	1,273	918	1,402
Dec.	1,133	909	1,289	907	1,439
1957					
Jan.	1,130	908	1,299	892	1,440
Feb.	1,121	905	1,306	884	1,438
Mar.*	1,111	900	1,307	876	1,423
Apr.*	1,098	894	1,291	862	1,393

*Preliminary.
U.S. Bureau of Labor Statistics.

volume for the two months. A year ago, that kind of business resulted in a build-up of backlogs. With today's increased production capacity, manufacturers find themselves dipping into that backlog to keep machines and men busy. This much is clear: In our "ever onward and upward" concept of the economy, we tend to think a year is only so-so unless it beats the preceding one.

Reviews Forecast; Ups GNP

The National Securities & Research Corp., New York, has no doubt about where the economy is headed. At the end of the first quarter, it reviewed the forecast of a gross national product of $430 billion which it made late in December and found it lacking. The corporation now says GNP will be $435 billion. Here is its revised forecast for 1957, compared with returns in 1956:

Personal consumption expenditures: $280 billion vs. $265.7 billion.

New private construction: $34.4 billion vs. $33.2 billion.

Producers' durable equipment: $31 billion vs. $28.7 billion.

Government purchases of goods and services: $86.5 billion vs. $79.8 billion.

Disposable income: $301 billion vs. $286.7 billion.

Industrial production (FRB): 146 vs. 143.

Plant and equipment outlays: $37.3 billion vs. $35.1 billion.

Manufacturers' sales: $346 billion vs. $331 billion.

Manufacturers' new orders: $346 billion vs. $337.8 billion.

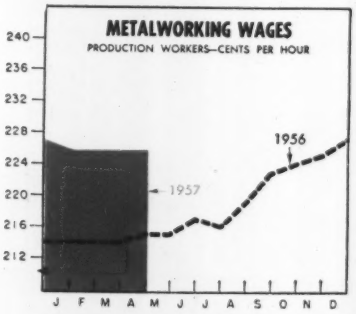
Corporate net profits: $22 billion vs. $21.5 billion.

Auto production: 6.3 million units vs. 5.8 million.

Steel output: 115.2 million tons, the same as last year.

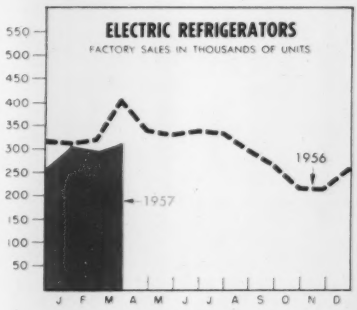
Bullish for '57

Put another forecast into the file for future reference: Last week at the annual meeting of the National Federation of Financial Analysts Societies, James M. Dawson, vice president, National City Bank of Cleveland, predicted a GNP of between $430 billion and $432 billion for 1957, an average FRB index reading of 146 and net corporate profits of $22.5 billion. The odds are 4 to 1 against another recession a la 1949 or 1954, says Mr. Dawson.



1956	Prim. Mtls.	Fab. Prod.	Mach-inery	Elec. Mchy.	Trans. Equip.
Apr.	233	204	218	196	226
May	233	204	218	196	226
June	234	206	219	197	228
July	227	206	220	198	229
Aug.	236	207	221	199	232
Sept.	241	211	225	201	236
Oct.	242	213	225	203	238
Nov.	244	213	225	204	239
Dec.	245	215	226	205	243
1957					
Jan.	247	213	226	206	237
Feb.	245	213	227	206	238
Mar.*	246	214	228	206	238
Apr.*	245	215	227	207	237

*Preliminary.
U.S. Bureau of Labor Statistics.



	Units 1957	1956	1955
Jan.	305,400	308,900	381,197
Feb.	298,700	316,000	338,575
Mar.	309,300	403,500	392,774
Apr.	.....	334,020	364,298
May	.....	327,874	390,385
June	.....	335,068	395,936
July	.....	331,916	323,240
Aug.	.....	297,906	310,789
Sept.	.....	262,359	313,143
Oct.	.....	212,200	235,945
Nov.	.....	211,600	234,786
Dec.	.....	257,400	312,535
Totals ...	.....	3,598,743	3,993,603

National Electrical Mfrs. Assn.

At the same meeting, Ralph M. Besse, executive vice president of Cleveland Electric Illuminating Co., predicted that in another ten years Ohio will be the No. 1 manufacturing state in the union. "This is not wishful thinking," he declares. "It's a projection of an existing trend." Ohio is now No. 2 on the basis of value added by manufacturing.

Wholesale Prices Advance

After holding the line for a month or two, wholesale prices continued the advance that brings the Bureau of Labor Statistics' index to 117.2 for April (1947-1949 = 100). The increase of 0.3 point was accounted for by farm products and processed foods; all other commodities declined for the second straight month (see table, page 72). On the basis of weekly reports, there will be little if any change in the indexes for May.

Freight Car Orders Rise

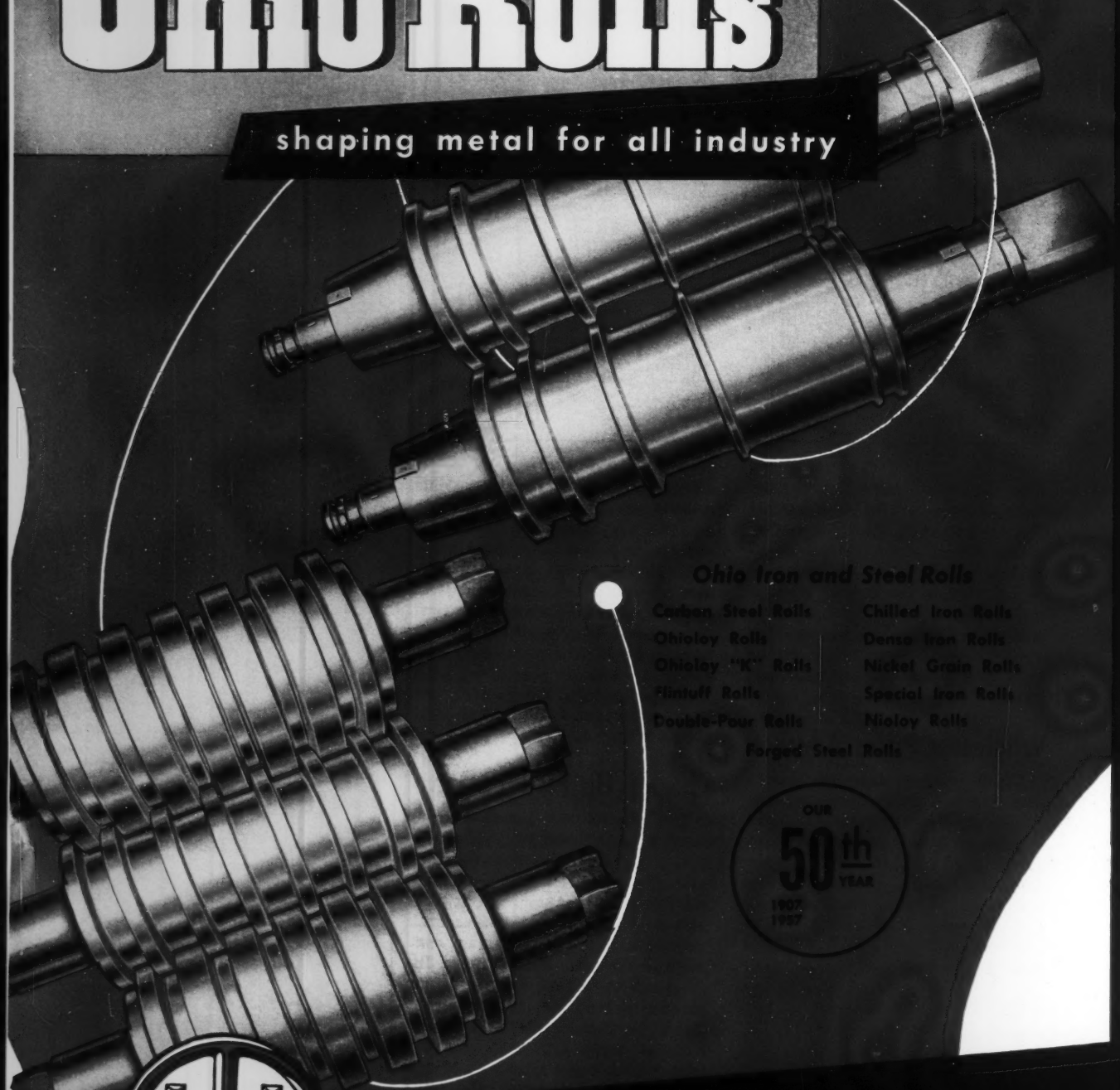
Railroad freight car deliveries and orders continued on the uptrend in April. Deliveries totaled 8961, down 811 units from those in March but a whopping 3018 units above those in April, 1956. This reflects an easier supply situation in structural steel and plates, as well as a better new order position this year than last. April orders rose to 6429, compared with 5359 in March. During the first four months of this year, railroads have ordered 23,181 freight cars, compared with only 11,670 during the comparable 1956 period. The backlog dropped 2518 units to 105,190 as of May 1.

Charters Up, Failures Down

The size of the business community got a boost in April when incorporations increased and failures decreased. Dun & Bradstreet Inc. reports that new stock corporations formed during the month numbered 12,078, a 2.2 per cent increase over the March figure. Incorporations during the first four months of 1957 are still 6 per cent under the comparable 1956 figure. Failures dropped to 1175 in April, 12 per cent down from the March postwar high. However, the total was 14 per cent above the year ago figure and represented the worst April since 1940. Combined liabilities totaled $57.1 million, 2 per cent over the March figure.

Ohio Rolls

shaping metal for all industry



Ohio Iron and Steel Rolls

Carbon Steel Rolls	Chilled Iron Rolls
Ohioloy Rolls	Dense Iron Rolls
Ohioloy "K" Rolls	Nickel Grain Rolls
Flintuff Rolls	Special Iron Rolls
Double-Pour Rolls	Nioloy Rolls
Forged Steel Rolls	

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Plants at Lima and Springfield, Ohio

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Combustion Eng. v. p.

JONATHAN KLUDT
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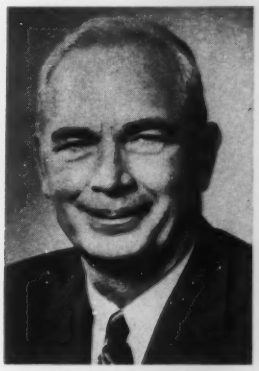


MEREDITH L. ADDY
John Wood div. p. a.

OTTO F. SEIDENBECKER
Northern Indiana Steel v. p.

Samuel R. Parry was elected vice president, **Combustion Engineering Inc.**, New York. He continues as general manager of the Chattanooga, Tenn., division.

Jonathan Kludt was elected executive vice president-general manager, **Lincoln Engineering Co.**, St. Louis, division of McNeil Machine & Engineering Co.

Herbert A. Long was made general manager-operations, **Pittsburgh Steel Co.**, Pittsburgh. He succeeds **Carl A. Breuer,** made vice president-operations Apr. 10. **John C. Peth Sr.** succeeds Mr. Long as chief engineer. **Elmer E. Barthel** was made chief electrical engineer.

William M. Haile was appointed president, **Linde Co.**, division of Union Carbide Corp., New York. He was vice president.

John F. Wooddell joined **Sheffield Foundry Co.**, Chicago, as plant superintendent. **Richard E. Marks** was made sales manager.

Interstate Drop Forge Co., Milwaukee, named **Bruno E. Weiss** director of sales; **Lawrence F. Schuetz,** sales manager; **H. C. Osborn Jr.**, production manager.

C. Donald McLain was made research and development manager, **Western Brass Mills,** division of Olin Mathieson Chemical Corp. He also will serve as chairman of the division's research and development committee. Mr. McLain continues as chief metallurgist. He is at East Alton, Ill.

Meredith L. Addy was made purchasing agent for the heater and tank division of **John Wood Co.**, Conshohocken, Pa. He was assistant purchasing agent to **Joseph C. Henderson** who retired in March.

Raymond A. Quadt was named director of research and development for **Bridgeport Brass Co.**, Bridgeport, Conn. He continues as vice president-research and development of Hunter Douglas Aluminum Corp., Riverside, Calif., acquired last year by Bridgeport Brass.

James H. Joyner was made general manager, Pioneer Works, **Quaker Rubber Division,** H. K. Porter Company Inc., Philadelphia. **B. V. Edmunds** was made works manager for Quaker Rubber.

A. L. Dyer Jr. was made superintendent of **Dana Corp.'s** aircraft department which operates as part of the Pottstown, Pa., division. This new department manufactures aircraft-type universal joints and propeller shafts.

C. D. Oberg was named director of sales, **Solar Aircraft Co.**, San Diego, Calif. **Alexander Black,** vice president-sales, resigned.

Richard Ochs was made production manager, instruments division, **Philips Electronics Inc.**, Mt. Vernon, N. Y.

Dr. James B. Austin was appointed vice president-research and technology, **United States Steel Corp.**, Pittsburgh. He was vice president-fundamental research.

Northern Indiana Steel Supply Co., Michigan City, Ind., appointed **Otto F. Seidenbecker** vice president in charge of the manufacturing division.

Milford D. Burrows was made director of engineering, **Porter-Cable Machine Co.**, Syracuse, N. Y. He was chief engineer of Bolen Products Inc.

Rear Adm. Robert A. J. English, USN, ret., was elected president, **Hall-Scott Inc.**, Berkeley, Calif. He joined American Pipe & Steel Corp. as vice president-manufacturing in 1951 after retirement from the service.

Donald H. Teetor, vice president of **Perfect Circle Corp.**, Hagerstown, Ind., was elected chairman to succeed his brother, **Lothair Teetor. William B. Prosser** was elected president to succeed **Ralph R. Teetor,** now active in product development. **Herman C. Teetor** was elected a vice president.

Joseph W. Greene was elected vice president-sales for **Crane Co.**, Chicago. He was director of industrial sales.

James F. Connaughton was elected president and chief executive officer of **Sterling Precision Corp.**, Buffalo. He continues as president of American LaFrance Corp.

United States Steel Supply Division, Chicago, U.S. Steel Corp., named **Jack F. Liberatore** manager, carbon steel and specialties; **Mal-**

EDWIN J. KEYES RAYMOND A. ST. JOHN

Heald Machine vice presidents

HAYWARD A. GAY PHILIP O. GEIER JR.

Cincinnati Milling Machine managers

colm Smith, manager, sheet and strip.

Edwin J. Keyes and **Raymond A. St. John** were elected vice presidents of **Heald Machine Co.**, Worcester, Mass. Mr. Keyes is works manager. Mr. St. John is general sales manager.

W. J. Lohmeyer Jr. was appointed to the executive sales staff at **Jessop Steel Co.**, Washington, Pa. He was sales manager in the Pittsburgh district for Latrobe Electric Steel Co.

Samuel A. Glueck, former general manager-eastern department, **Federated Metals Division**, American Smelting & Refining Co., was named general manager-midwestern department. He has headquarters at Federated's Whiting, Ind., plant. **Louis D. Alpert** was made general manager-eastern department, New York.

George Turner and **Bert M. Walter** were elected vice presidents of **Clark Equipment Co.** Mr. Turner is in charge of production at the transmission division, Jackson, Mich. Mr. Walter is in charge of industrial and labor relations, with headquarters at Buchanan, Mich.

James W. Rimmer was made sales manager in charge of the Portland, Oreg., office of U.S. Steel Corp.'s **Columbia-Geneva Division.** He succeeds **Elbert M. Foudray**, assigned to other sales duties. Mr. Rimmer was sales manager, Salt Lake City office.

Edward C. Wagner fills the new post of assistant to the vice president-engineering, **Ford Instrument Co.**, division of Sperry Rand Corp., Long Island City, N. Y. **Michael A. Moscarello** was named engineering director of marine equipment.

Charles R. Wirshing was named metalworking chemicals sales manager, west coast district, **American Chemical Paint Co.**, at Niles, Calif.

Woodman Perine was elected president of **Vitro Engineering Co.**, division of Vitro Corp. of America, New York. He replaces **Richard A. North**, general manager of the division, who has resigned.

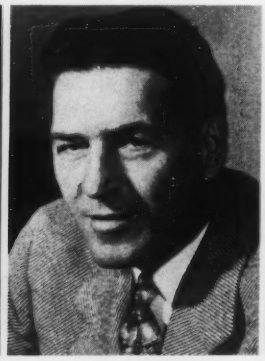
Thomas W. Metz was made manager of the mid-Atlantic region of **Allis-Chalmers Mfg. Co.'s** industries group to succeed the late **Frank R. Freyler.** Mr. Metz is replaced as manager, Indianapolis district, by **John L. Wiedey.**

Cincinnati Milling Machine Co., Cincinnati, appointed **Hayward A. Gay** manager, machine tool division; **Philip O. Geier Jr.**, manager, products division. **Swan E. Bergstrom**, executive vice president, has been acting manager of the machine tool division. Mr. Gay, a company vice president, managed the products division.

Homer A. Wilson was made manager of **Republic Steel Corp.'s** culvert division to succeed **M. L. Eckman**, retired. **James Fitzgerald** was named assistant division manager.

I. M. Chambers was made manager of product design and development, **Henry Miller Spring & Mfg. Co.**, Pittsburgh.

George D. Lawrence was made chief engineer-electric furnaces for



GEORGE W. GUTEKUNST C. H. RIEMAN BRICE D. MADDOX

Gardner-Denver vice presidents

Gardner-Denver Co., Quincy, Ill., elected as vice presidents: **George W. Gutekunst**, general sales manager; **C. H. Rieman**, general manager of the Denver plant; and **Brice D. Maddox**, general manager of the Keller Tool Division, Grand Haven, Mich.

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W. M. BROXHAM

Graver Tank & Mfg. vice presidents

JOHN M. ROBINSON

EDWARD J. ETZEL

DeVilbiss executive posts

American Bridge Division, U.S. Steel Corp., Pittsburgh.

Graver Tank & Mfg. Co. Inc., East Chicago, Ind., promoted **S. E. Allen** to vice president and general manager of all company operations; **W. M. Broxham** to vice president and general manager, plate and alloy products division. Mr. Allen was general manager of plate products. Mr. Broxham was vice president-sales for all Graver operations.

J. C. Smith was made manager of the Bowling Green, Ky., plant of **Detrex Chemical Industries Inc.** He was chief engineer, dry cleaning division.

Paul A. Crone was made manager, cold drawn bar sales, **Viking Steel Co.,** Cleveland.

Davis Hutchinson joined **Wyle Mfg. Corp.,** El Segundo, Calif., as chief engineer in charge of design, production and distribution of its Hydrashaker. He was with Century Engineers.

T. J. Ludwa was made assistant sales manager, **Calumet Steel Castings Corp.,** Hammond, Ind.

Bohn Aluminum & Brass Corp. appointed **Ray V. Burdeno** plant manager of its Betz Division, Danville, Ill.

Raymond K. Dykema Jr. was made Cleveland district manager-sales, stainless steel division, **Jones & Laughlin Steel Corp.**

Delhi Foundry Sand Co., Cincinnati, elected **H. F. McVay** president; **Lillian McVay,** executive vice president; **William R. Oakley,** vice president; **James E. Reedy,** vice president-sales.

Jess E. Bunch was made manager; **Richard A. Noblett,** assistant manager, plating equipment division, **Automotive Rubber Co. Inc.,** Detroit.

Don L. Clithero was made vice president-marketing, a new post at **Ross Heat Exchanger Division,** American Radiator & Standard Sanitary Corp., Buffalo.

Marne A. Dubs was named manager of the engineering laboratory at the Tonawanda, N.Y., laboratories of **Linde Co.**

W. R. Nolf was made manager of the Dix avenue plant (Detroit) of **Wagner Bros. Inc.** He was plant superintendent, nuclear products division, American Car & Foundry Co.

Edwin L. Frick Jr. was named industrial eastern division manager, **Atkins Saw Division,** Borg-Warner Corp. He is in Philadelphia.

At the Hanover plant of **Solar Steel Corp.** at Union, N.J., **Samuel W. Solomon** was made vice president-general manager.

Mississippi Valley Structural Steel Co., Melrose Park, Ill., appointed **Walter A. Stuckey** assistant to the plant manager; **Robert LaBounty,** plant superintendent; **Gordon Nord,** assistant plant superintendent; **R. C. Kidd,** industrial engineer.

Don P. Selby was made assistant sales manager, Cincinnati, for **United States Steel Corp.**

John M. Robinson was elected executive vice president, **DeVilbiss Co.,** Toledo, O. He was vice president-finance. **Edward J. Etzel,** director of purchases, was made vice president-purchasing. **John M. Ehni,** export sales director, was elected vice president-foreign sales.

Charles E. Phayre was made assistant sales manager, **Penn Precision Products Inc.,** Reading, Pa. He was a sales representative for Riverside Metal Co.

G. James Alaback was made director of engineering at **Whirlpool Corp.'s** St. Joseph, Mich., division.

Joseph R. Smith was made western district manager of **Flick-Reedy Corp.,** Melrose Park, Ill.

William L. Cressman was made assistant general sales manager, **Jones & Laughlin Steel Corp.,** Pittsburgh.

Charles H. Good Jr. was made assistant to vice president, operations-steel, **U.S. Steel Corp.,** Pittsburgh. He was chief engineer, Duquesne Works.

James Wilson was elected president, **Mid-West Forging & Mfg. Co.,** Chicago. He was vice president. He succeeds **Jay L. Hench,** who becomes chairman and continues as chief executive officer and as treasurer. **Ray T. Johnson Jr.** was elected executive vice president, a new post, and continues as secretary. **Noble Gibson** was elected vice president-sales manager.

Fruehauf Trailer Co., Detroit, named **William M. Dawe** assistant to the vice president-sales; **Harry**

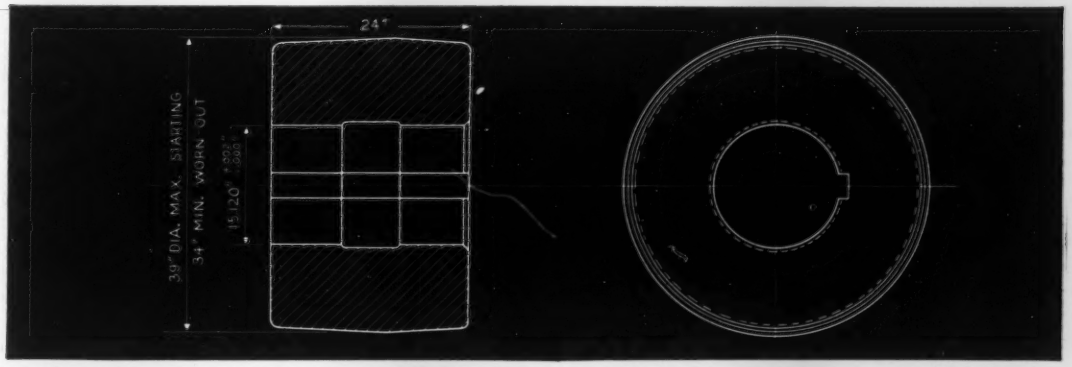
TIPS FROM A ROLL MAKER'S NOTEBOOK

MACKINTOSH-HEMPHILL DIVISION, E. W. BLISS COMPANY, Pittsburgh 3, Pennsylvania

Cast mill rolls • Johnston cinder pots • rotary tube straighteners • end-thrust bearings • heavy-duty lathes • steel and special alloy castings

THE SECRET OF GOOD TUBE MILL RINGS:

Put the extra metal where it does the least harm



Any roll ring cast with a cored hole creates special problems. Tube mill piercing rolls are no exception.

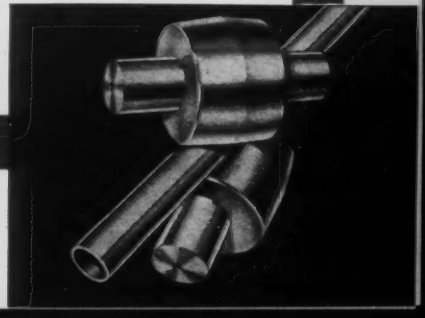
General foundry practice has been to allow sufficient stock on both the outside diameter and bore to permit "giving a little and taking a little" to "true" the finished O. D. with the I. D. when machining. Mack-Hemp foundrymen have modified this practice by keeping the outside stock at a minimum and increasing the stock in the bore. This extra stock in the bore provides an ample margin for "truing up" the two diameters during finishing, with only a bare minimum of metal removed from the O. D.

The roll user benefits in two ways—better rings at a lower price. In the first place, with roll rings priced as they are, on a "cent-per-pound-on-rough-weight" basis, he saves money. This is because extra metal near the center of the roll weighs far less than the same thickness at the roll surface. For instance, every ¼" of oversize on the O. D. of a 39" diameter, 24" long ring adds roughly 110 pounds of metal. On the other hand, ¼" extra stock on the 15" bore of the same ring adds only 40 pounds.

The segregation problem—Even more important, however, is the improvement in the depth of sound metal below the surface of the cast roll which is gained by casting to minimum tolerances on the O. D. and maximum on the I. D. Mack-Hemp tube mill rolls are noted for their freedom from the "segregated streaks" which lead to scrapping before worn-out diameter. Since these flaws usually occur at a fairly regular depth below the outside surface of a cast roll, the closer the O. D. as-cast diameter is to the finished diameter, the deeper this zone of segregation.

The relation of "bite" to hardness and wear—A very important requisite of a piercing mill roll is good "bite" to eliminate slippage. Ideally, this should be achieved without sacrificing too much wear resistance. Fortunately, bite and wear resistance are not always in direct proportion to hardness. Both these qualities can be combined—at least to a degree—in the same roll. For example, a roll of one alloy type may slip more than a harder roll of another type. Today, higher speed mills have stepped up the demand for these better, harder rolls.

Mack-Hemp's broad experience with the many tube mills now in operation can be of real help to any tube mill operator with a roll problem. And it's the same story no matter what your type of mill. For help with any problem of roll use, call on Mackintosh-Hemphill Division, E. W. Bliss Company, 901 Bingham Street, Pittsburgh 3, Pennsylvania.



MACKINTOSH-HEMPHILL

You get more tonnage from the rolls with the Striped Red Wabblers

Division of E. W. BLISS COMPANY

Presses, Rolling Mills, Special Machinery

M & M develops another specialized machine

New automatic inline transfer machine

handles 650 pistons per hour at 100% efficiency

Pistons are delivered to the first station of machine by a conveyor. They are picked off this conveyor, loaded into the machine, processed and delivered to another conveyor . . . all automatically. Here is the sequence of operations performed:

Station 1—Accept and unload piston from conveyor chute.

Station 2—Orient piston in relation to pin bores and bosses, using an electric eye and orientating table.

Station 3—Push piston down against positive locator by means of hydraulic expanding lug. Drill center of dome end and spot face two sections from the bottom upwards.

Station 4—Mill weight pads.

Station 5—Spot drill drive holes in weight pads.

Station 6—Drill drive holes in weight pads.

Station 7—Ream drive holes in weight pads.

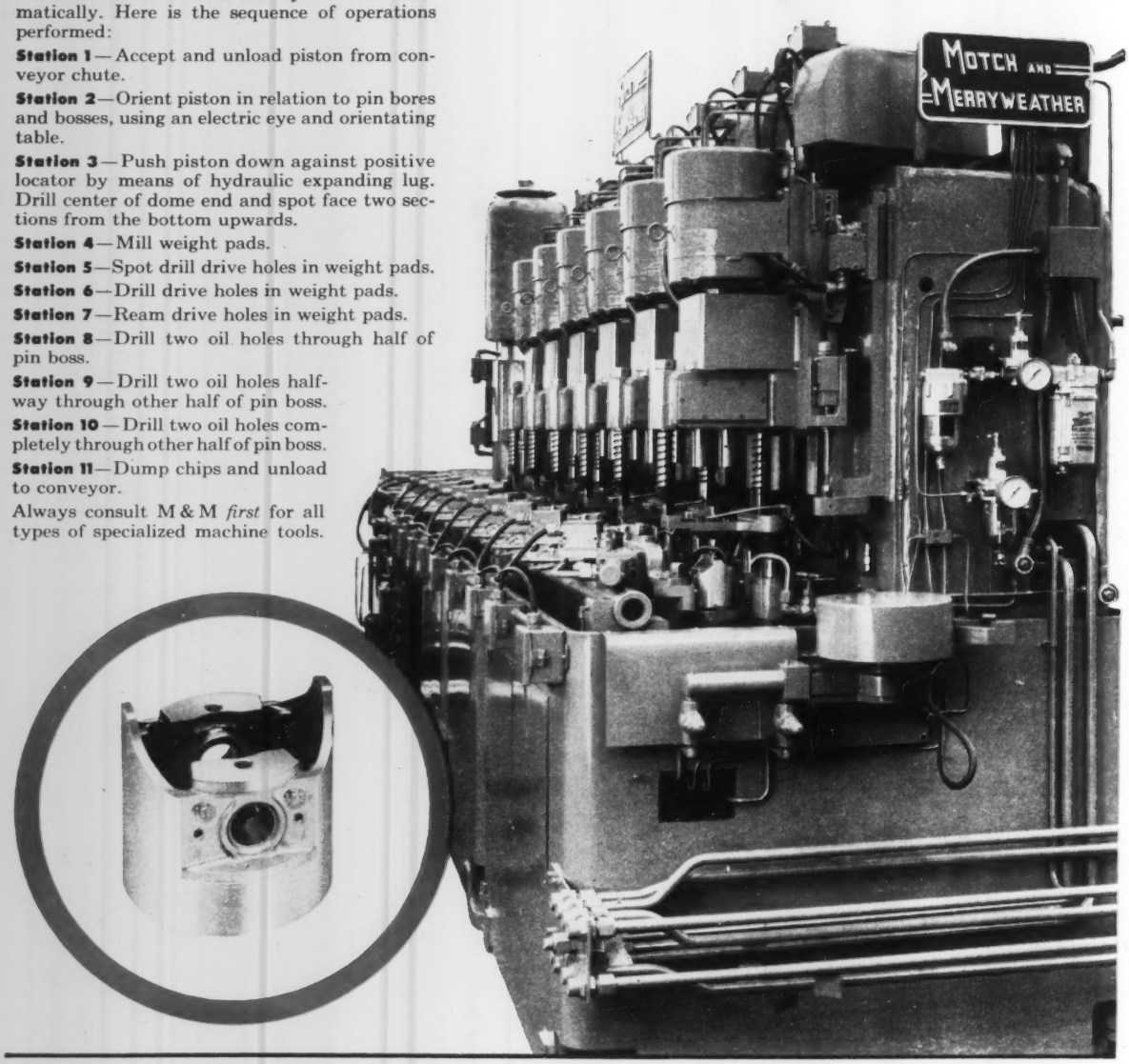
Station 8—Drill two oil holes through half of pin boss.

Station 9—Drill two oil holes halfway through other half of pin boss.

Station 10—Drill two oil holes completely through other half of pin boss.

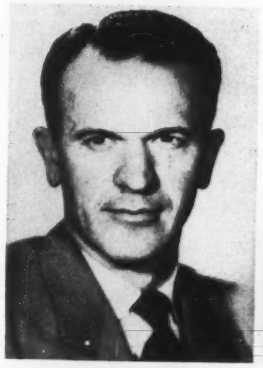
Station 11—Dump chips and unload to conveyor.

Always consult M & M *first* for all types of specialized machine tools.



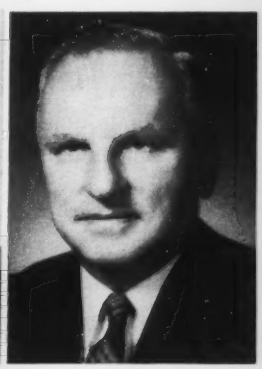
the **MOTCH & MERRYWEATHER MACHINERY** Company

MACHINE TOOL MFG. DIVISION
CLEVELAND, OHIO



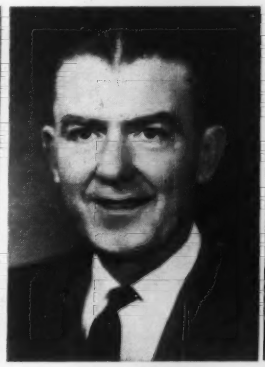
L. A. DePOLIS
sales dir. for Clark trucks

H. B. STAFFORD
Mine Safety Appliances post

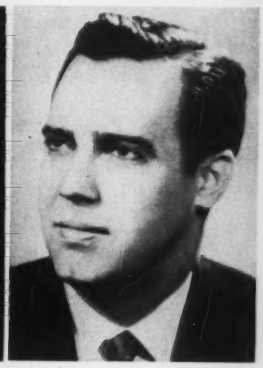


HENRY DUFFY
McDowell v. p.-mfg.

RONALD E. JONES
O. A. Sutton purchasing dir.



G. D. HEFFRON
Union Iron Wks. gen. mgr.



ALLAN B. FREDHOLD JR.
General Logistics gen. mgr.

R. Fruehauf Jr., Detroit branch manager.

Ronald E. Jones was made director of purchases for **O. A. Sutton Corp.**, Wichita, Kans. He held a similar post at A. C. Gilbert Co.

Union Iron Works, Decatur, Ill., appointed **G. D. Heffron** general manager; **Loren M. Veech**, plant superintendent; **Melvin R. Malone**, sales manager. **Roy M. Hamilton**, president, retired after 37 years with the company.

Ferd Chiappetta was made wire rope engineer for **Macwhyte Co.**, Kenosha, Wis., to succeed **William C. Russell**, retired.

Michigan Chemical Corp., St. Louis, Mich., elected **H. Stanley Lawton** vice president in charge of sales and market development.

S. V. Malin was made district manager at Detroit for the industrial division, **Gould-National Batteries Inc.**

Allan B. Fredhold Jr., former plant manager, was made general manager of **General Logistics**, Pasadena, Calif., subsidiary of Aeroquip Corp.

Norman A. Spector was named vice president of **Vitro Corp. of America**, New York.

Duane Branaka was made district manager at Beloit, Wis., for the automotive division, **Warner Electric Brake & Clutch Co.**

Jerome A. Raterman was elected chairman of **Monarch Machine Tool Co.**, Sidney, O., to succeed the late **Wendell E. Whipp.** Mr. Raterman was also re-elected president.

Robert L. Campbell was made manager-metal sales, western division, **New Jersey Zinc Co.** He is at Chicago.

Irving Leeds joined **Maxson Instruments Division**, W. L. Maxson Corp., Long Island City, N.Y., as manager of transformer engineering.

L. A. DePolis was made director of sales, industrial truck division, **Clark Equipment Co.**, Battle Creek, Mich. He was general sales manager. **Bert E. Phillips** was made sales manager.

K. L. Steele was named manager of manufacturing; **D. N. Wise**, manager of engineering in the safety products division, **Mine Safety Appliances Co.**, Pittsburgh. **H. B. Stafford** was made operations manager of a newly established technical products division; **N. W. Hartz** was made sales manager.

Henry Duffy fills the new post of vice president-manufacturing at **McDowell Co. Inc.**, Cleveland, and affiliates. He was vice president of R. C. Mahon Co.

Clarence C. Smith was made director of engineering, **Tranter Mfg. Inc.**, Lansing, Mich.

Dr. Russell R. Law joined **Hughes Aircraft Co.** as director of new product development for Hughes Products Group, the firm's commercial activity. He has headquarters at the group's Los Angeles International Airport facility.

OBITUARIES...

Frank M. White, 60, vice president, **Stanley Works**, and general manager of the pressed metal division, New Britain, Conn., died May 15.

John S. Seltzer, 55, manager of purchases, **Jack & Heintz Inc.**, Cleveland, died May 14.

George M. Dreher, 56, superintendent of chemical services, **Jones & Laughlin Steel Corp.**, Pittsburgh, died May 12.

August A. Rickert, 85, co-founder and chairman of **Rickert - Shafer Co.**, Erie, Pa., died May 7.

Robert E. Miller, 65, founder and chairman, **Accurate Screw Co.**, Chicago, died May 14.

Hildemar M. Hillman, founder of **H. M. Hillman Co.**, Brooklyn, N. Y., died May 10.

Cornelius F. Kelley, 82, chairman of the executive committee, **Anaconda Co.**, New York, died May 12.

The pit
nobody
liked...
except
our
customers

This is of course our one-way fired soaking pit . . . fired from the top.

The location of the burner is only one of the features responsible for its enthusiastic acceptance. Most important however are the 30 years of experience and refinements which we have built into the pit since we first introduced it.

That is why, today, it is the pit everybody respects . . . especially our customers.

STEEL MILL, HEAT TREAT, GLASS DIVISIONS

SURFACE COMBUSTION CORPORATION

2408 DORR ST., TOLEDO 1, OHIO

wherever heat is used in industry

Associated Companies: British Furnaces, Ltd., Chesterfield • Stein & Atkinson, Ltd., London • Stein & Roubaix, Paris • S. A. Belge, Stein & Roubaix, Bressoux, Liege • S. A. Forni Stein, Genoa • Chugai Ro Kogyo Kaisha, Ltd., Osaka • Benno Schilde Maschinenbau, A. G., Bad Hersfeld

Surface

NEW UDYLITE bright zinc

ZB-57 FOR BARREL PLATING

ECONOMY OF OPERATION

Operational economy is a major feature of ZB-57 Bright Zinc. The zinc brightener is long-lasting, and has excellent stability, even at elevated temperatures.

EXCEPTIONAL PLATING SPEED

New Bright Zinc ZB-57 lets you increase production up to 75% per barrel and per man-hour. Gives beautiful bright zinc coatings, even at higher voltages.

AN UNUSUALLY WIDE BRIGHT PLATE RANGE

Even in plating parts of complicated shapes with deep recesses, this new Udylite Bright Zinc provides excellent color, and minimum variation in luster.

CAN BE TAILORED TO THE JOB

With ZB-57, the basic solution formulation can be varied to meet special plating needs such as deep throw of the plate, or highest demands for speed.

BEAUTIFUL COLOR

The blue-white finish of ZB-57 sparkles with sales appeal! It is unusually bright, and exceeds by far the standard for a decorative bright zinc.

BRIGHT DIPPING

Since deposits have exceptional brightness, bright dipping is often eliminated. ZB-57 Bright Zinc ensures high quality finishes with minimum processing.

RECEPTIVE TO CHROMATE TREATMENTS

Where desired, the zinc deposit is extremely receptive to clear or colored chromate treatments, and other post treatments.

EXCELLENT PROTECTION AGAINST CORROSION

The protection against corrosion afforded by a zinc coating is proportional to its thickness. This process is no exception. Users will receive more protection per dollar than ever before.

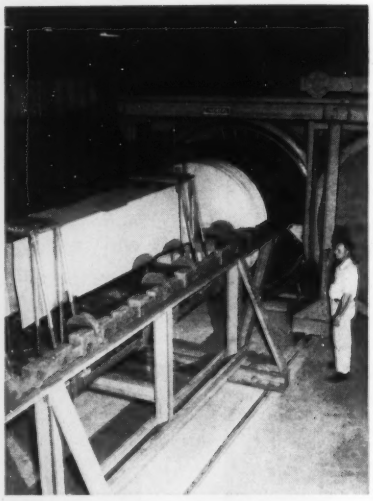
POWDER OR LIQUID BRIGHTENER AVAILABLE

ZBP-57 is a dry powder for maximum economy in long distance shipping. For those who prefer the simplicity of liquid additions, ZBL-57 is available.

Consult your Udylite representative, or write us directly about your needs for bright zinc plating. A test run of this new Udylite process will convince you.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER



Big Vacuum Furnace

It permits processing of larger titanium parts. Other metals will be handled soon

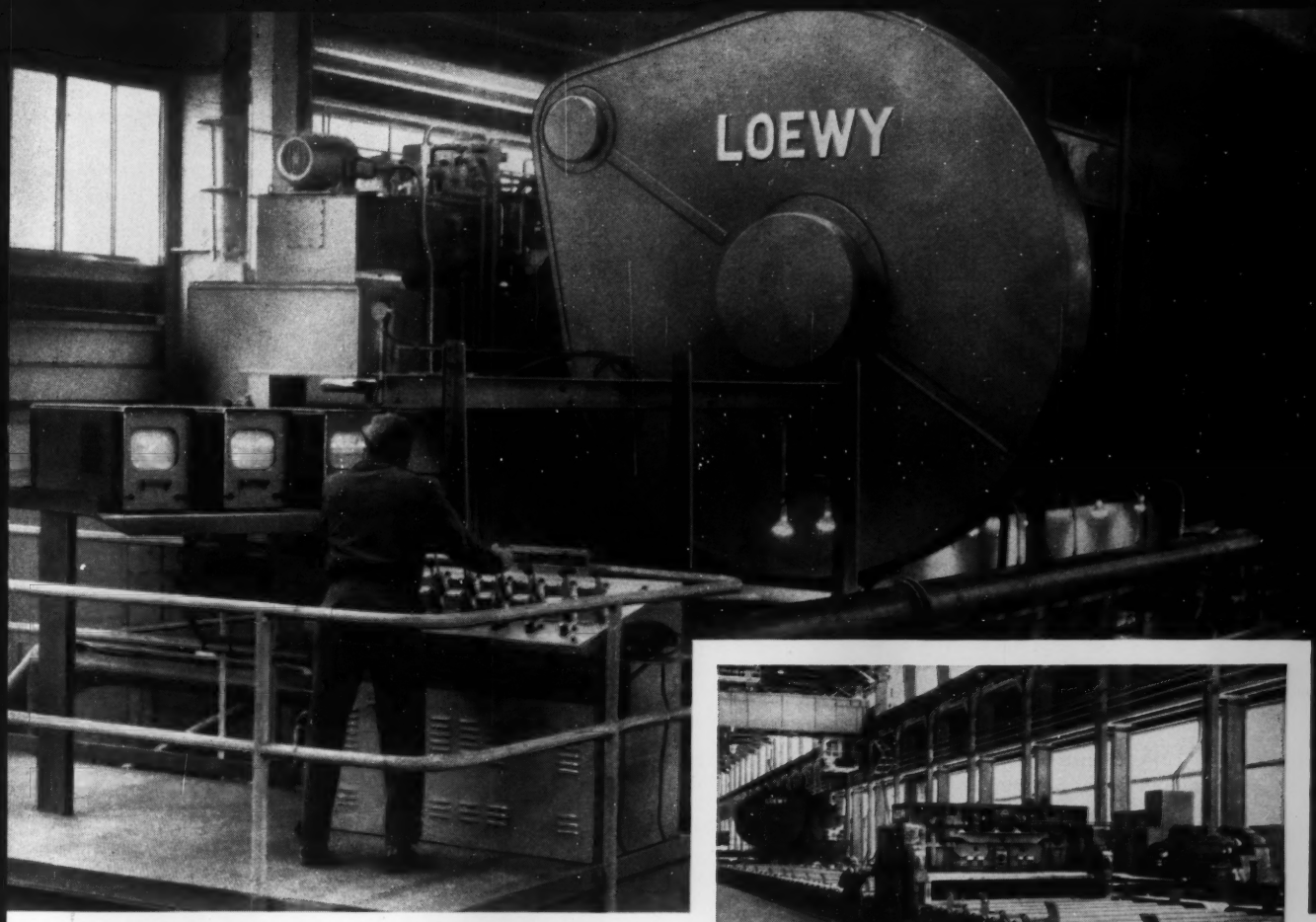
TITANIUM parts for intercontinental guided missiles are being processed in a new, heat treating vacuum furnace at North American Aviation Inc.'s Missile Development Division, Downey, Calif. Through high temperature and vacuum, it makes commercial grades of titanium easier to form and better able to withstand extreme in-flight temperatures. Hydrogen impurities which cause the metal to be brittle and crack under stress are removed.

The furnace was built by Lindberg Engineering Co., Chicago. It is over 40 ft long, with a work chamber 6 ft in diameter and over 14 ft long. Temperatures up to 2100°F are possible. Parts are rolled on rails (see above).

Stokes Unit—The vacuum system (it can evacuate the 1400 cu ft furnace to 0.3 microns in 23 minutes) was made by F. J. Stokes Co., Philadelphia.

For the first time, company officials say, full size flat sheets of titanium can be wheeled into a vacuum annealing furnace. Previously, sheets had to be cut down or rolled to fit. The operation is slated to be extended to titanium forgings, extrusions and formed parts and other metals soon.

The installation also will be used to braze sheet metal honeycombs. A unique internal tube cooling sys-



oewy-Hydropress alloy steel plate shear with completely mechanized, one-man-perated plate manipulator at the Lukens Steel heat treating plant, Coatesville, Pa.

Loewy designed and built shearing and leveling line at Lukens Steel.

At Lukens Steel . . . one-man-controlled alloy steel plate heat treating and shearing installation

The 800-ton-capacity alloy steel plate shear shown above is part of a complete Loewy-Hydropress shearing-leveling and mechanized plate-handling installation at Lukens Steel's Coatesville plant, considered the most modern alloy steel plate heat treating facility in the United States.

By means of a specially developed plate manipulator —a truly mechanized handling system—the need for manual plate handling has been eliminated. One shear performs all cutting operations in succession. It is capable of cutting up to 1¼-in.-thick alloy steel plate. All movements for cutting four sides of the plate are remote-controlled by one operator who moves it into the shear, lines it up with the aid of a TV circuit, and then accurately cuts it to size.

This Loewy-Hydropress installation is another outstanding example of the advanced auxiliary equipment so vital to a really integrated mill operation.

Loewy-Hydropress, builder of all types of rolling mills, also designs and builds roller-straighteners, levelers, manipulators, individually driven motor rollers, ingot pushers and tilters, transfer tables, mechanical cooling beds, and other auxiliary equipment to the customer's individual requirements. The vast, integrated facilities of Baldwin-Lima-Hamilton enable Loewy to speed the delivery of this equipment.

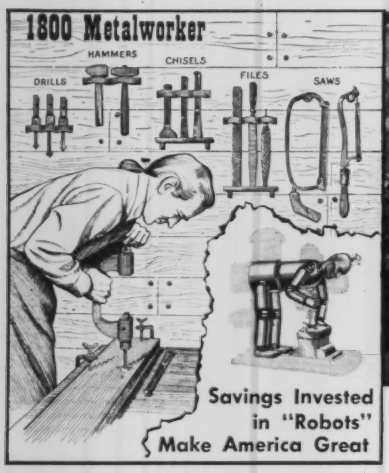
Write us today, Dept. B-5, for further information.

Loewy-Hydropress Division

BALDWIN · LIMA · HAMILTON

111 FIFTH AVENUE, NEW YORK 3, N.Y. Rolling mills • Hydraulic machinery • Industrial engineering

BALDWIN BLH LIMA-HAMILTON



Savings Invested in "Robots" Make America Great

DoALL band machine offers the newest machining concept, an unrestricted work zone, with no limit to the length or direction of the cut.

By 1967 each worker will require far greater investment in tools than the $12,500 of today.

Mr. Congressman: Don't Kill the Goose

Unrealistic taxation is throttling savings and investment in the "tools" of production, the real source of America's greatness. Industrial productivity is losing ground in relation to the increasing population.

A brief review of our industrial system helps explain the situation.

About 150 years ago, robots, called machine tools, began replacing hand tools. Work was clamped in a vise, while a power-driven cutting tool, traveling in a completely controlled path, performed the desired machining operations. Thus, it was possible to turn out many pieces exactly alike, rapidly and accurately. Also other "tools," such as steam engines and steel rolling mills, could now be produced with these machine tools.

New products at low prices began to flow to market. People had more and better clothing and food and new kinds of services. And, every time savings were invested in better "tools," more abundance resulted.

Today, things are going wrong with this process. Demand for capital to purchase "tools" has been greater than the savings available. Bank credit has been used instead, so the price of money has risen. This is a principal reason for inflation.

Our national stock of industrial plant equipment increased by $34.9 billion during 1956, resulting in our greatest year of prosperity. But so far in 1957, capital spending isn't keeping pace with our expanding population and relatively smaller labor force. Prices are up because wages have risen more rapidly than the productivity of workers. Tight money throttles business expansion. The goose that lays the golden eggs is getting such bad treatment that the following legislation is urgent:

(a) Change the tax law that ignores the fact that the dollar's purchasing power to replace equipment shrinks faster than the machinery depreciates, thus making less and less of industry's declining profit available to finance growth and expansion.

(b) Reduce Government spending and general taxation so that more profits and savings for capital equipment can be accumulated.

(c) Eliminate double taxation of earnings and dividends which discourages the accumulation and investment of savings.

Only the productive can be strong. Only the strong can be free.

Reprints of this series on economics available for your employees.

E-104N

MACHINE TOOLS to increase human productivity in sawing, grinding and lapping are the specialty of The DoALL Company. DoALL also provides industry with more than 1500 cutting tool, gaging and supply items. Literature available upon request.

The DoALL Company
Des Plaines, Illinois
38 Local Sales-Service Stores

tem has been built into the furnace to set the braze prior to moving the treated metal into the cooling chamber, which is an integral part of the unit.

Machine Tool Maker Expanding

National Automatic Machine Tool Co. Inc., Richmond, Ind., built a plant addition which increases manufacturing space by 30 per cent (to 342,000 sq ft). It makes room for new production equipment.

Establishes Amplifier Lab

To facilitate the research and development of magnetic amplifier products, American Electronics Inc. has established a laboratory at its Electrical Machinery & Equipment Division in El Monte, Calif. Richard Howard is divisional manager.

Wolverine Tube Building

Wolverine Tube Division of Calumet & Hecla Inc., Detroit, is constructing an administrative office in Allen Park, Mich. It will consist of two buildings: A 24,000 sq-ft structure for headquarters and general sales office activities and a 7000 sq-ft structure for research and development.

Flexible Shaft Moves Plant

Robertshaw-Fulton Controls Co., Greensburg, Pa., moved its Flexible Shaft Division to a new and larger manufacturing plant in Chatham, N. J. This division was acquired recently as part of Acro Mfg. Co., Columbus, O. Flexible Shaft formerly was known as the WKT Corp. and occupied a plant in Plainfield, N. J. R. J. Hasemann is divisional general manager.

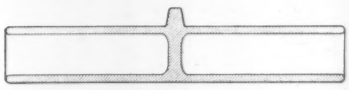
Cleveland Technical Center

A $1,525,000 Engineering & Scientific Center is being built by the Cleveland Engineering Society. It will provide facilities for the exchange of technical information among more than 15,000 technical people in the area. More than 53 engineering and technical groups will use it.

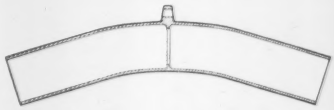
Warren H. Chase, president of

THE CAMERON CURE FOR DESIGN DILEMMA

How would you produce this relatively simple component? Actually, it's not simple but Cameron had the cure. This actuator for the horizontal stabilizer of the North American F-100 **Super Sabre** is a cylinder with a thin solid center section and one central protrusion. For-



merly it was a weldment – two sections of tube stock with a small forging in the center – right here is where the headache developed because a cold bending operation was required. Welds parted, rejects were too high. The Cameron split-die forging process changed all of this.



Now it is forged in one piece. Grain structure is excellent, final machining and cold bending are easy–rejects are low and design department spirits are up.

If you have a problem in a ferrous component (200 to 5000 lbs.), especially one for critical service, with internal curvatures and perhaps odd protrusions which cannot be forged in conventional dies, CALL ON CAMERON.

Our facilities are complete from melting of high quality alloy steels for our unique forging operations to final machining if desired. Many knotty design problems are finding a simple solution in the unusual shapes and quality controlled alloys coming from Cameron. Write or call . . .

Cameron
IRON WORKS, Inc.
SPECIAL PRODUCTS DEPARTMENT
P. O. Box 1212, Houston, Texas

11 year continuity in oxygen production with "on-location" generators

Since 1946, Weirton Steel Company, a division of National Steel Corporation, has obtained its oxygen requirements from "on-location" generators . . . designed and built by Air Products, Incorporated. Present production capacity is 300,000,000 cu.ft./mo. of low-purity (95%) and 35,000,000 cu.ft./mo. of high-purity (99.5%) oxygen . . . for all uses from blast furnace air enrichment to scarfing.

Many steel companies obtain low-cost oxygen from dependable Air Products generators in many combinations of quantity, purity and pressure.

We produce: package, tonnage and custom-built oxygen and nitrogen generators. Check with us for detailed information on a dependable and continuous supply of low-cost oxygen. Air Products, Incorporated, P.O. Box 538, Allentown, Pa.

Air Products
...INCORPORATED

Weirton Steel...

... put three 2,000 cfh oxygen generating plants (total—4,000,000 cf/month)—built by Air Products—into operation over eleven years ago. Since that time, Air Products has met the increasing needs for oxygen at Weirton by supplying additional oxygen facilities (up to the present 335,000,000 cf/month total capacity).

This continuity of a low-cost supply of oxygen over the years has been possible only through the use of dependable "on-location" generators—designed and manufactured by Air Products.

Continuity of supply at Weirton is a typical benefit resulting from steel companies' use of "on-site" oxygen generators. Other steel companies enjoy such profitable advantages as: substantial reductions in oxygen cost . . . dependable production of high purity oxygen 24 hours/day . . . flexibility in meeting increased or decreased demand through proper equipment sizing. Even plants requiring limited quantities of oxygen can profitably use Air Products generators.

Let us show you how you can have a dependable low cost supply of oxygen without capital investment. Air Products "on-site" oxygen generators supply many of the nation's leading steel plants. We'd like to talk to you about them . . . your inquiry is invited. Air Products, Incorporated, P.O. Box 538, Allentown, Pa.

Air Products ...INCORPORATED

the society, says the center should be a factor in helping industrial firms reduce technical labor turnover and attract new talent to the area.

ASSOCIATIONS

The **Malleable Research & Development Foundation** has officially opened its offices in Granville, O. William E. Mahin, president, will direct the group's scientific and industrial research program. The foundaton was formed through the efforts of Albion Malleable Iron Co., Albion, Mich.; Auto Specialties Mfg. Co., St. Joseph, Mich.; Dayton Malleable Iron Co., Dayton, O.; National Malleable & Steel Castings Co., Cleveland; Wagner Malleable Iron Co., Decatur, Ill.; and Belle City Malleable Iron Co., Racine, Wis.

Aluminum Window Manufacturers Association, New York, re-elected R. L. Klein, Windalume Corp., Kenvil, N. J., president and treasurer; John Jansson, executive vice president. Vice presidents are: W. E. Zipp, Ceco Steel Products Corp., Chicago; A. G. Monroe, Reynolds Metals Co., Louisville; and E. C. Munro, Ware Laboratories Inc., Miami, Fla. Edward F. Kelly is administrative secretary and assistant treasurer.

Richard G. Jones, secretary, controller and a director of Handy & Harman, New York, supplier of silver, gold and their alloys, was elected president of the **New York City Control of the Controllers Institute of America,** New York.

Ezra J. Kennedy Jr., assistant secretary of the **American Institute of Mining, Metallurgical & Petroleum Engineers Inc.,** New York, retired.

Copper & Brass Research Association, New York, elected these officers: President, Austin R. Zender, Bridgeport Brass Co., Bridgeport, Conn.; senior vice president, J. M. Kennedy, Revere Copper & Brass Inc., New York; treasurer, F. L. Riggin Sr., Mueller Brass Co., Port Huron, Mich.; manager, T. E. Veltfort; and secretary, Carl H. Pihl. Vice presidents are: C. P. Goss, Scovill Mfg. Co., G. P. Bakken, Chase Brass & Copper Co. Inc., and W. M. Moffatt, American Brass Co.—all are Waterbury, Conn. firms; Terry W. Kuhn, Bohn Aluminum & Brass Corp. and D. W. Blend, Wolverine Tube Division of Calumet & Hecla Inc.—both are Detroit firms; and W. W. Sieg, Titan Metal Mfg. Co., Bellefonte, Pa.

CONSOLIDATIONS

Archer-Daniels-Midland Co., Minneapolis, is negotiating for the acquisition of the **Federal Foundry Supply Co.,** Cleveland. The Minneapolis firm is a leading manufacturer of foundry core oils. Federal produces powdered coal, core washes, core facings, parting compounds, core blowing machines, bentonite and vermiculite.

H. H. Robertson Co., Pittsburgh, acquired **Porcelain Steel Corp.,** Connersville, Ind. The Indiana property will permit Robertson to complement its line of colored metal products for architectural uses.

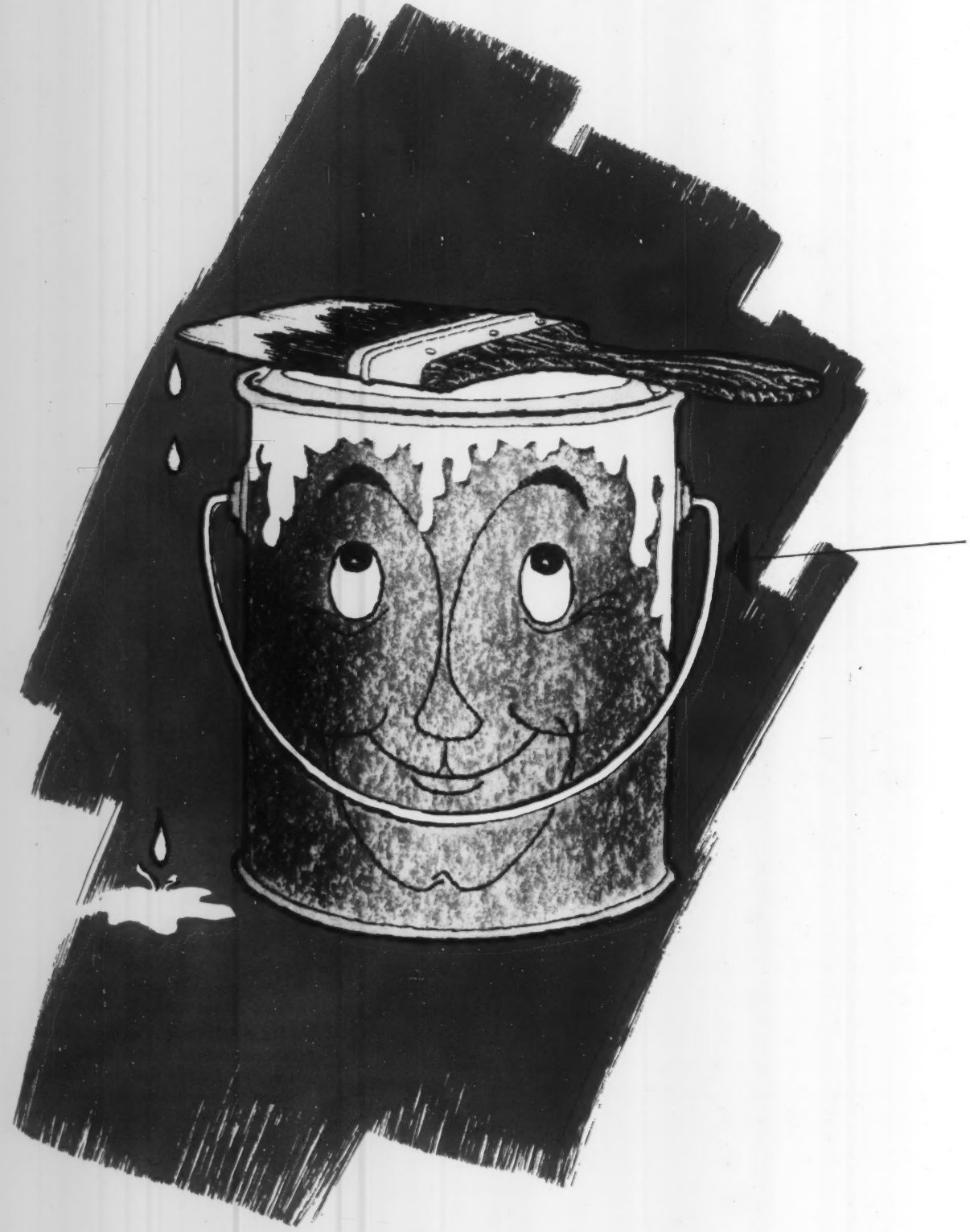
NEW ADDRESSES

Cruicible Steel Co. of America moved its St. Louis warehouse to 8610 Page Blvd., that city. The new facility has 33,600 sq ft of warehouse space and 5250 sq ft of office space. J. J. Wycall is the new St. Louis branch manager.

Springfield Tool & Die Inc., maker of tools, dies, jigs, fixtures and special machinery, moved to 2005 Westwood, Dearborn, Mich.

Conax Corp., manufacturer of thermocouple assemblies, pressure sealing glands and explosive actuated valves and mechanisms, moved into its new plant and general offices at 2300 Walden Ave., Buffalo 25, N. Y.

Liebros Casting Co. Inc, moved it offices and plant to 39-30 Review Ave., Long Island City 1, N. Y.



Painting is easier with a bucket which has a dependable, easy-to-use handle made from low carbon, hard drawn CF&I-Wickwire Pail Bail Wire.

Chances are you don't need pail bail wire to make paint bucket handles. But *you may need one or more of the nearly 100 different categories of specialty wire for which CF&I-Wickwire is famous.* Let us show you how we can meet your most rigid chemical and physical specifications on high and low carbon wire in all sizes, shapes, tempers, finishes and grades.

the painter's helper

Check This List!

FOR THE WIRE YOU REQUIRE, SEE CF&I-WICKWIRE.

FLAT AND SHAPED WIRES
Armor Wire
Bobby Pin Wire
Bookbinder Wire
Brush Wire
Casing Wire
Cotter Pin Wire
Curtain Spring Wire
Die Spring Wire
Gutter Broom Wire
Lock Spring Steel
Rake Tine Steel
Regulator Spring Wire
Snake Fishing Steel
Stapling Wire for Preformed Staples (Flat)

LOW CARBON FINE AND SPECIALTY WIRE
Bee Wire
Bonnet Wire
Bookbinder Wire
Broom Wire
Clip Wire
Dent Spacer Wire
Drapery Pin Wire
Florist Wire
Fuse Wire
Glass Netting Wire
Hairpin Wire
Hook and Eye Wire
Mattress Wire
Picture Cord Wire
Picker Tooth Wire
Pin Ticket Wire
Pin Wire
Ring Traveller Wire
Spiral Binding Wire
Stapling Wire
Stapling Wire for Preformed Staples
Stone Wire
Weaving Wire
Weaving Wire for Fly Screen Cloth
Wissco Iron Wire

HIGH CARBON FINE AND SPECIALTY WIRE
Aircraft Cord Wire
Armor Wire
Belt Hook Wire
Bobbin Ring Wire
Brush Wire (Tempered and Untempered)
Brush Wire (High Strain)
Chrome Vanadium Spring Wire
Core Wire (Aluminum Cable Steel Reinforced)
Curtain Spring Wire
Flexible Shaft Wire
"Gamma" Spring Wire (Upholstery Spring Wire)
Zig Zag Wire
No-Sag Wire
Hat Wire
Heddle Wire
Hose Reinforcement Wire
Hose Wire, Mechanical
Hose Wire, Vacuum and Defroster
Rope Wire
Signal Corps Wire
Spoke Wire
Hard Drawn Spring Wire
Oil Tempered Wire
Spheroidized or Annealed Spring Wire
Tire Bead Wire
Valve Spring Wire

MANUFACTURERS LOW CARBON COARSE WIRE
Bag Tie Wire
Basket Handle Wire
Box Binding Wire
Brush Handle Wire
"Cal-Tie" Wire
Can Key Wire
Case Hardened Ball Wire
Chain Wire
Clamp Wire
Clothes Pin Wire
Concrete Wall Reinforcement Wire
Garment Hanger Wire
Hay Baling Wire (Coiled)
Lingo Wire
Lintel Wire
Loop Wire
Merchant Quality Wire
Pail Bail Wire
Rivet Wire
Stapling Wire
Strand Wire
Tying Wire
Welding Wire
Wissco Iron Wire
Industrial Quality Wire
Cold Rolling Quality Wire
Heading, Forging or Roll Threading Quality Wire
Medium High Carbon Wire

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BEARING TIPS by McGill

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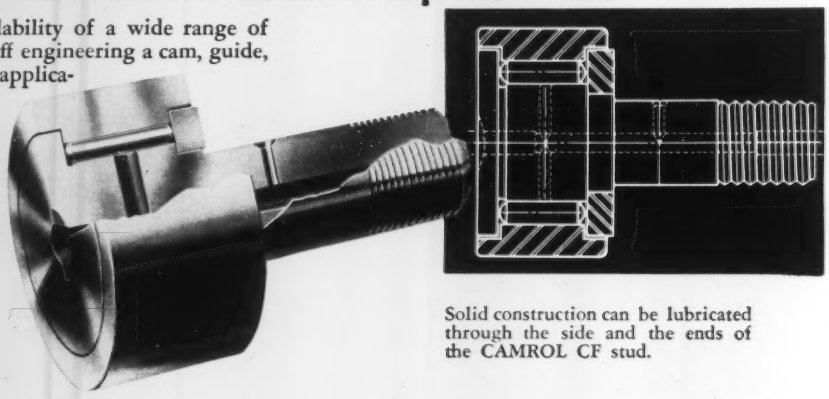
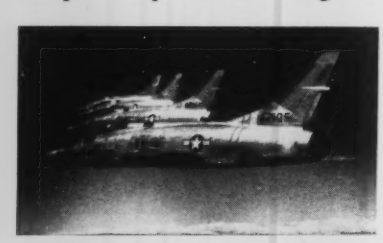
Simplification of design with availability of a wide range of standard bearings takes the strain off engineering a cam, guide, support or track roller bearing application. No need to "build up" a special unit when you can select the proper size standard CAMROL bearing engineered especially for the job. McGill's CAMROL bearing construction offers full type capacity, with provision for shock, in a compact precision unit. Specify CAMROL, the original cam follower, in either CF (with stud) or CYR (shaft mounting) series. Sealed and prelubricated bearing available also.



Solid construction can be lubricated through the side and the ends of the CAMROL CF stud.

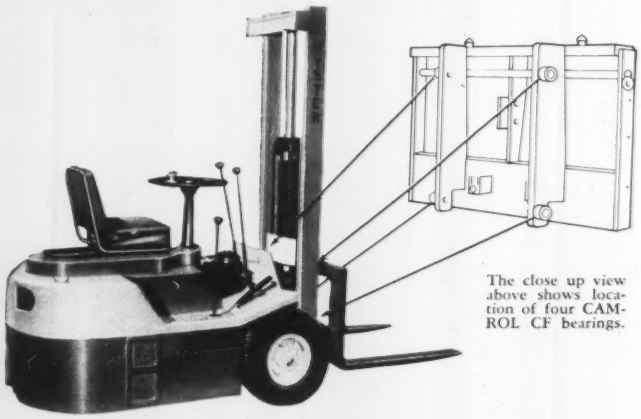
YR bearings help F-100 Super Sabre make slower and safer landing

The supersonic speeds obtained by today's modern aircraft set up design problems not encountered with older, slower planes. The overall streamlined design required for speed in flight, for instance, necessitated finding ways of supporting the North American F-100 Super Sabre at low air speeds required for landing. A



series of slats on the leading edge of the wing, providing greater lift at lower air speed, was the answer. Each slat is supported by McGill CAMROL YR bearings — especially designed to permit shaft or yoke mounting. These long-life bearings carry the loads of these slats as they move on tracks during flight of the Supersonic F-100.

CAMROL CF bearings out-perform friction rollers as fork support bearings



The close up view above shows location of four CAMROL CF bearings.

Small size and high load-carrying unit construction with simplified lubrication are among principal benefits obtained by Hyster Company from use of CAMROL CF bearings as fork support rollers in its Hyster 20 and other lift trucks.

Two bearings ride up and down inside each vertical mast section to position the lift truck fork under load. Speeds are relatively slow but the crushing loads on each bearing are heavy.

In this particular application, the exterior surfaces of the bearings are treated with a black oxide finish. This provides corrosion-resistance which serves to augment maintenance-free operation, a characteristic of CAMROL bearing construction.

Fact-packed Bearing Catalog

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Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL®
Precision Needle Bearings

McGILL MANUFACTURING COMPANY, INC., 301 N. LAFAYETTE ST., VALPARAISO, INDIANA

Technical Outlook

WEAR DETECTIVE— IBM, New York, has a new radioisotope laboratory, which will study wear. Parts will be impregnated with a radioactive material and placed in a machine or robot. Measurement of the tiny quantities of tracer material in lubricant residue evaluates wear too slight to be detected by other methods. The laboratory will also be used for radiography testing (like x-ray) of large castings and machine parts.

HEAT-UP HELP— A refractory called Insulag that burns away at 1800 to 2200°F is saving hours of heat-up time for open hearth furnaces. Gunned over a new silica roof, the refractory provides an insulating coating only ¼-in. thick that lets the roof heat up quickly without spalling. The same refractory has been used for fireproofing. It's a product of the Quigley Co. Inc., New York.

DUCTILE MOLY WELDS—Researchers at Battelle Memorial Institute, Columbus, O., report that good molybdenum welds depend on the shielding atmosphere. Outside of dry-box procedures, best methods are an inert gas shielding cup and a leading-trailing shield unit. Cleaning, recrystallization of fibered sheets and low purity atmospheres had little effect on ductility.

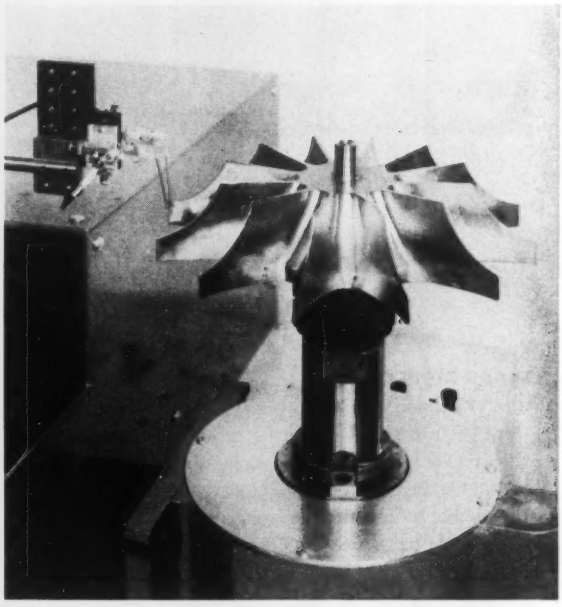
SEMICONDUCTORS FOR HEAT— RCA researchers have come up with compound semiconductors for transistors and diodes that can operate efficiently over a broad range of frequencies at 850°F—nearly 300°F hotter than present single material types. The most promising material, gallium arsenide, is said to combine the best features of germanium and silicon. Applications: Electronic equipment for hypersonic aircraft and missiles; further miniaturization of computers and other systems which now require special cooling.

PUSHING EXTRUSION— Engineers at Allegheny Ludlum's Watervliet (N. Y.) works recently made an extrusion from Type 410 stainless that resembles the firm's monogram: AL. The perimeter of the cross section is roughly ten times its area. The extrusion was made at production speed on production equipment despite problems posed by the unusually complex shape.

CHAMPION ANALYZER—Buick has a new, 50,000 volt, x-ray machine for these jobs: Metals analysis, atomic structure magnification, measurement of depth and quality of chrome platings and lubricant analysis. Vern Hense, chief metallurgist, says it reveals the structures of materials which were almost impossible to obtain with other methods, "giving us a better approach to quality problems."

CRATES OF STEEL— Wooden shipping boxes and crates are being replaced by steel at the Ft. Worth, Tex., plant of Convair Division of General Dynamics Corp. Assembled from steel angles that have holes to take bolts at almost any point, the crates are cheaper because they can be used many times. They're stronger and take less time to build than wooden crates, says Convair. Known as Dexion slotted angle, the material is made by Acme Steel Co., Chicago.

Metalworking Outlook—p. 47 *Market Outlook—p. 141*



This machine inspects one part at a time. Single probe and part are at the left; Flexowriter control and strip chart are behind the operator. Computer is built into machine. Close-up shows probe in action

Tape Controls Inspection Machine

Fast inspection of complex parts requires measurement, correlation of measurements and computation. Here are two machines which inspect parts made on tape controlled machines

THE MAN in the photo above is watching a tape controlled machine automatically inspect the vanes on an impeller.

It is an example of the progress being made in inspection automation.

W. S. Tandler, president, Warner & Swasey Research Corp., New York, producer of the machine, last week told the American Society for Quality Control in Detroit that the principles used by the equipment solve the inspection problems of automation.

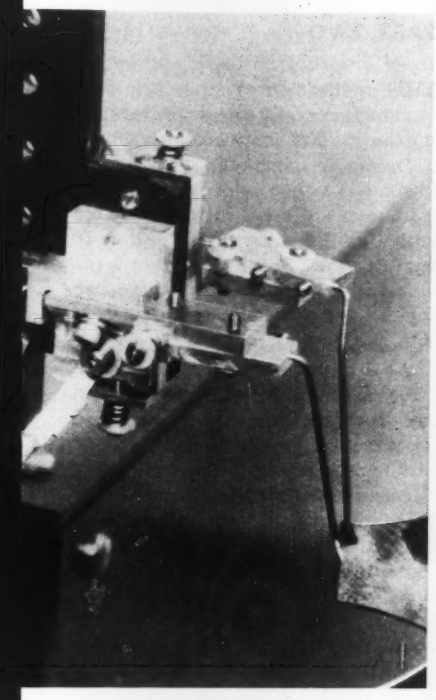
He observed: "It looked for awhile as though production automation would completely outdistance inspection automation. We believe that we're on the road to holding our own, or gaining the lead."

Duplication—Here is the significance of the development and some of the operations the equipment performs.

- One inspection machine can check an almost infinite variety of parts.
- Parts made with tape control can be inspected automatically with a tape made from the original one.
- Inspection and machining tapes made by a prime contractor can be distributed to subcontractors. This eliminates discussions, interpretations and conflicts.
- The inspection machine will point out inaccuracies and indicate the modifications which must be made in the machining tape.

Types—Mr. Tandler's firm has developed two machines. The Probomat inspects parts one at a time. The Probograph inspects them in large quantities.

Here's how the Probomat works.



The probes are adjustable and operate in the form of a T. Right probe is measuring a portion of impeller vane

The part to be measured is mounted on a rotary fixture (illustration, page 94). Probes are mounted on a holder which is moved by an arm extending from the measuring head in the machine. The holder is moved by program control to positions and measuring points indicated by the part blueprint.

As the probes contact the part, the measurement is indicated by dots on a strip chart which is advanced a little for each measurement. Each dot can be numbered by an automatic stamper.

Quantities—The Probograph inspects large quantities of parts like turbine and compressor blades. Measurements are taken at 40 to 50 points simultaneously and the results computed. A green light indicates acceptance, red, rejection. The machine prints the deviations on a strip chart. No record is made of good parts.

Sets of pin masters are used to set up multiprobe machines. Probing points in the masters are adjustable pins ground to the proper contour. Master parts can also be used but are less reliable and not adjustable. In addition, the offset dimension and station dimension are fixed, an important factor in interpretation and automatic sorting.

Opinion—Mr. Tandler feels that tape control is a great step forward toward automatic machinery that is flexible. Such equipment can be used profitably by the small and large producer.

With complex, multidimensional parts, an individual measurement can be of little significance. It is the correlation of measurements which determines acceptability.

Such correlation involves more than addition and subtraction. It frequently requires a high order of computation. It is in this area that the traditional approach finds its limitation, says Mr. Tandler. His solution is a machine that measures, computes and makes decisions to accept or reject automatically.

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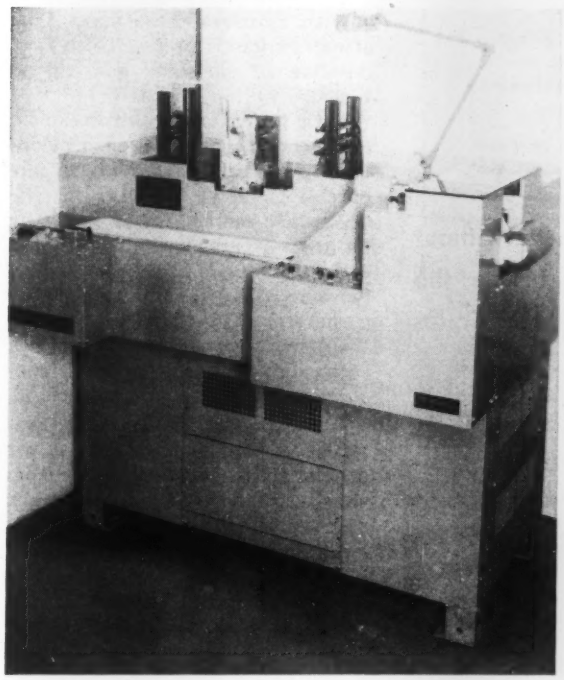
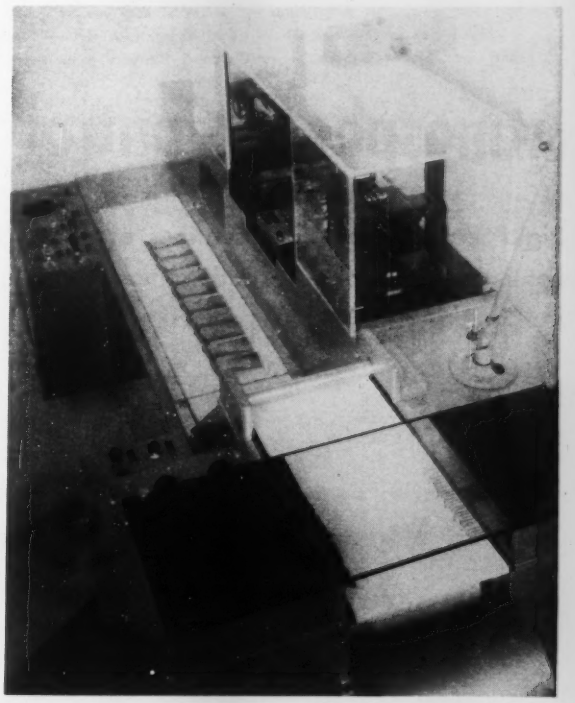
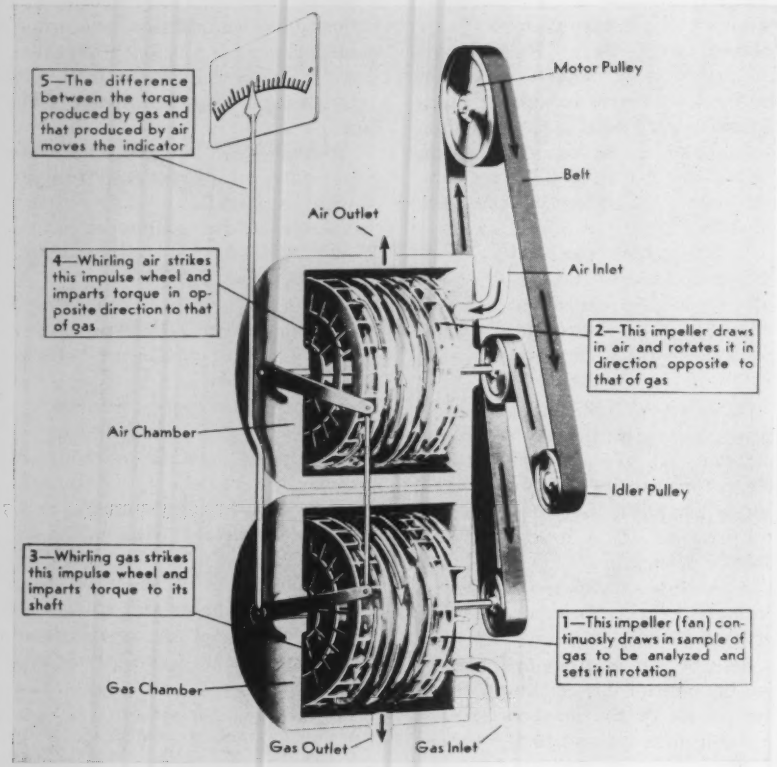


The inspection machine above is for large quantities of parts. Called a Probograph, it measures up to 50 points simultaneously. Acceptance or rejection is indicated by red or green light



Here's a closeup of the Probograph. Strip chart and styluses are at left. Banks of probes and holding fixtures are at center right

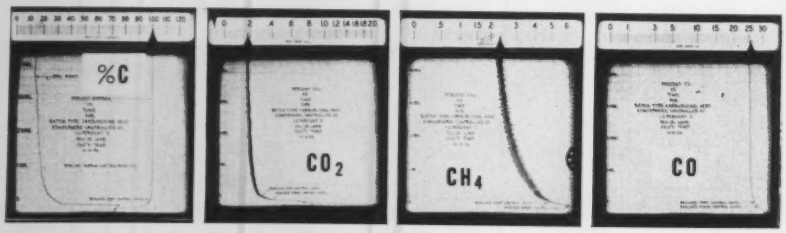

5—The difference between the torque produced by gas and that produced by air moves the indicator
Motor Pulley
Belt
Air Outlet
4—Whirling air strikes this impulse wheel and imparts torque in opposite direction to that of gas
Air Inlet
2—This impeller draws in air and rotates it in direction opposite to that of gas
Air Chamber
Idler Pulley
3—Whirling gas strikes this impulse wheel and imparts torque to its shaft
1—This impeller (fan) continuosly draws in sample of gas to be analyzed and sets it in rotation
Gas Chamber
Gas Outlet
Gas Inlet

Here is how one indicator measures the specific gravity of a gas sample. Air and gas samples are drawn into separate chambers where fans whirl them against an opposing fan. Difference in torque indicates specific gravity

Atmosphere Control

Rigid metallurgical specifications are hard to meet without continuous control of furnace atmosphere. In this article, the author describes systems selection and sampling techniques

By WAYNE BESSELMAN
Leeds & Northrup Co.
Philadelphia



Here is a typical arrangement of continuous recorders for controlling batches in a carburizing furnace. It is connected to a system which controls the atmosphere generator

PART TWO

THE application of automatic control to furnaces and generators requires careful engineering.

Detection time for changes in measured value must be kept to a minimum. This requires short sampling lines and rapid rates of sample flow. Some analyzers have relatively slow rates of response which will increase the detection lag.

As contrasted with temperature control, where the heat storage in the furnace insulation, alloy and metalwork provides flywheel or stabilizing effects, the control of furnace and generator atmospheres is more difficult because there is no similar stabilizing influence. Because of such lags and stabilizers, control equipment must be of high quality and of the proportional position or input control type. It's better to choose the three-function type: Proportional band, rate action and reset action.

Tips—Samples should be taken carefully from a point in the furnace which represents the average atmosphere composition. It is essential that the furnace atmosphere be well circulated.

With furnaces, a constant flow of carrier gas is preferable so that the flow of enriching gas can be varied.

With generators, control can be obtained with the final element operating the ratio setter on the carburetor.

Another method is to keep the air-gas mixture constant with the carburetor and use a controlled valve in a by-pass line around the carburetor. The total gas flow to the generators should be kept at a reasonably constant value to conserve generated gas not being used.

Recommendation—Too much emphasis cannot be placed on proper sampling. It should be taken from the furnace as close to the work as possible.

The sampling tube must be a high alloy material which will not oxidize. It should extend through the furnace wall at least 4 in.

The sampling lines to the analyzers either should be copper or stainless tubing—never use iron. You must be sure that all lines are tight and kept clean by adequate filtering. A filter should be

placed at the furnace connection.

Provide a means for easy clean-out, especially for the sample tube into the furnace since soot tends to accumulate here.

With batch type furnaces (especially when measuring dew point), it is important to shut off the sample until the furnace temperature has recovered. Low temperatures and burning-out air produce high dew points which produce a large amount of condensation in the sample lines. Result: You will get erroneous dew point readings, sometimes for hours, until the condensate has been purged from the line.

When considering automatic control, remember to keep sample lines as short as possible to reduce measuring lags to a minimum.

Conclusion—Which analyzer to use for a given application is not an easy choice.

If you want precise knowledge of the composition of the atmosphere, one or more of the independent type analyzers should be used: Dew point analyzers for H_2O, or infrared analyzers for CO, CO_2 or CH_4.

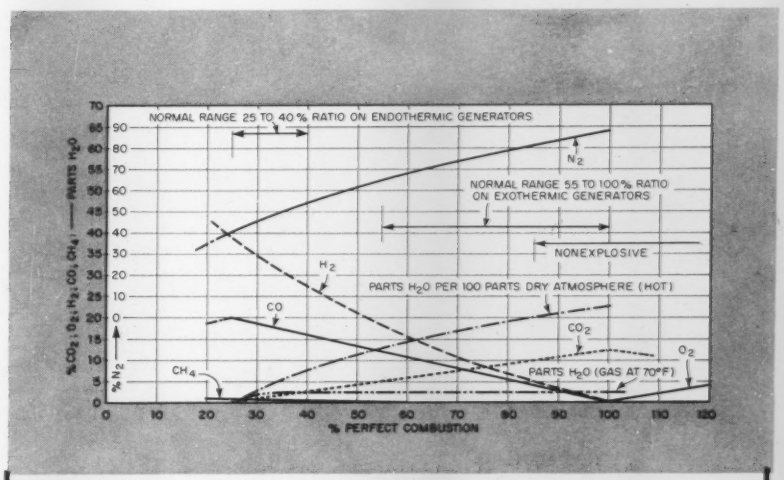
For safety or purging purposes where knowledge of total combustibles is required, a combustible analyzer is adequate.

For a simple, two-component gas system, such as dissociated ammonia or completely burned gas, a specific gravity indicator might be best.

If you want a precise knowledge of carbon potential and there are large departures from equilibrium conditions like those in batch carburizing, the hot wire type analyzer is indicated.

The more important consideration is that rugged, industrial analyzers, which have passed the test of usage, are available from several manufacturers. Those interested in the research, development and application of furnace atmospheres should utilize such analyzers to the fullest extent to promote improved and reproducible metallurgical quality.

• *An extra copy of this article and Part I which appeared last week are available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, O.*



The Six Basic Furnace Atmospheres

IN FURNACE work, heat treaters are primarily concerned with six basic atmospheres: 1. Exothermic combustion gas. 2. Endothermic combusfion gas. 3. Nitrogen. 4. Dissociated ammonia. 5. Hydrogen. 6. Inert gases like argon and helium.

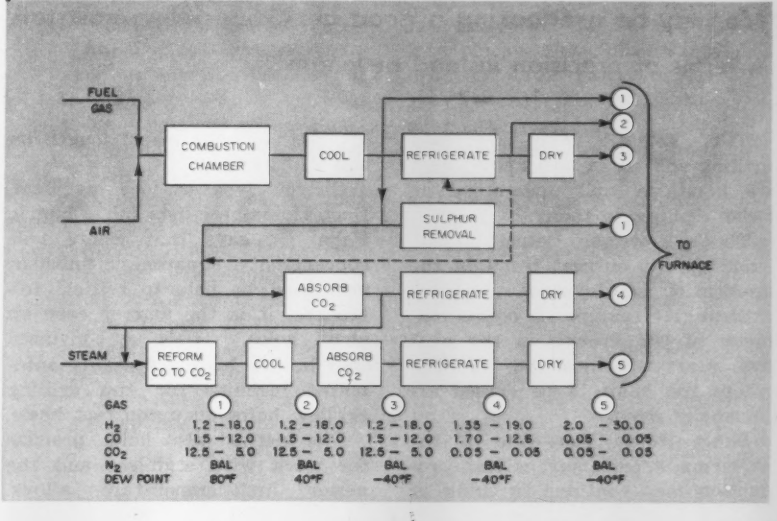
Exothermically produced gas is the type most widely used. Advantages: Simplest equipment, widest range of variations and the greatest number of applications.

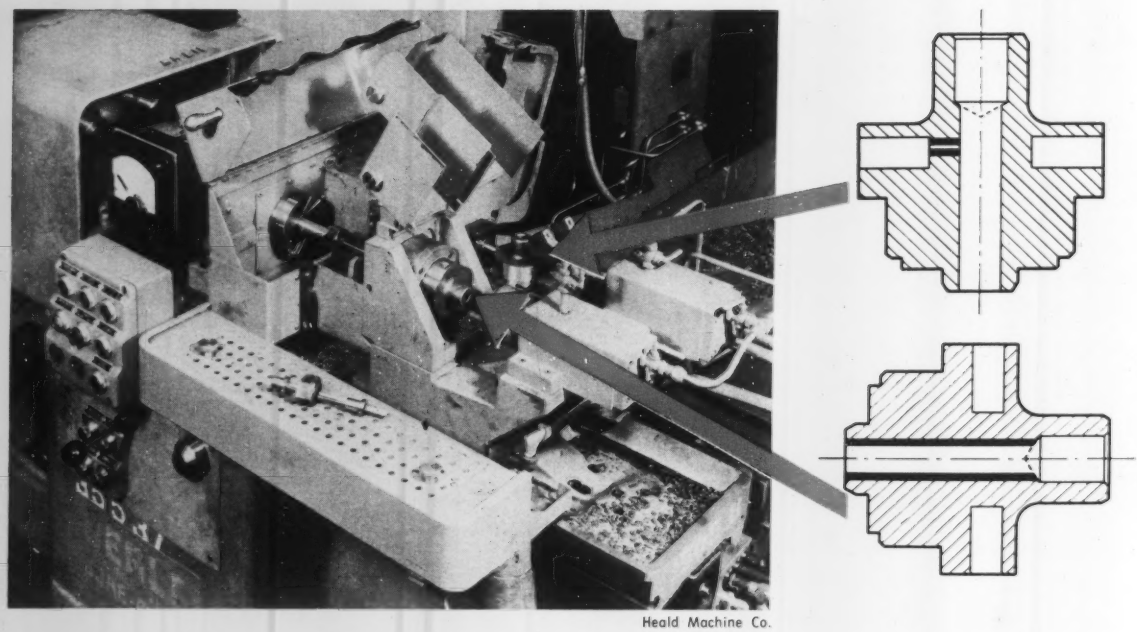
The graph (above) illustrates how the elements of an atmosphere vary with changes in the fuel-air ratio of the generator or burner. The flow chart (below) shows how the components of the atmosphere can be modified through additional treatment.

Endothermically produced gas is made by reacting a fuel-air mixture at a high temperature. The gas-to-air ratio is 25 to 40 per cent of that required for perfect combustion. An external heat source is needed to maintain the proper temperature.

The goal of the endothermic reaction is an atmosphere which contains the least possible amount of carbon dioxide (CO_2), water vapor and methane (CH_4).

Chart and graph were prepared by C. H. Vaughan, assistant vice president, Electric Furnace Co., Salem, O. They were given at a symposium on furnace atmospheres sponsored by the Industrial Heating Equipment Association Inc. Mr. Besselman's article is also based in part on material presented at the symposium.





Heald Machine Co.

Side-by-side gun drills cut two holes in these Nitralloy hydraulic heads. The drill in the front station puts in the plunger hole; at the rear station, the drill adds the port hole. The machine turns out 27 parts an hour (controlled by the longer plunger hole) holding a 0.001-in. tolerance. Surface of the holes is 20 microinches. Coolant flows through the drills at 750 psi

New Look at Gun Drilling

If you're thinking of this process in terms of deep holes only, you may be overlooking a good bet. Specialists now talk in terms of precision instead of length

"FIVE YEARS from now, gun drilling will be as well known and, we hope, as well understood as twist drilling is today."

That's how one Detroit expert sums up the current trend in the application of this tool.

Strangely enough, he points out, much of the growth in the next five years will not be on jobs where the holes to be drilled are unusually deep.

Short Holes, Too—One of the problems, experts say, is that production men continue to think of the method in terms of length instead of accuracy.

Charles Weaver, vice president, Deep Hole Specialists Inc., Chagrin Falls, O., says that where hole concentricity, squareness, finish or size must be held to critical tolerances, it is the answer even on short holes. He's so convinced that he has built a specially automated machine for gun drilling shallow holes on a contract basis.

The method also holds promise for work with stainless and the newer high-temperature alloys. Since many of those metals work harden, it may be a tough job to make second and third passes through the hole. It is nearly impossible to straighten a crooked hole. Many times, jet engine makers are finding out, gun drilling can give them the desired results in a single pass.

How? — Gun drills are single point, end-cutting tools, similar to boring cutters, except that the cutting edge extends through the center of the tool to drill from the solid. Coolant is forced through the drill center at high pressures (about 300 to 1500 psi), emerging as both a coolant and chip flusher at the tip. Chips are forced back along the single flute and out of the hole. A thin film of the coolant also separates

the drill from the hole to prevent rubbing and galling.

Pilot—Gun drilling is precise because the drill is continuously piloted. The cutting edge is followed by wear pads that guide the cut, steering from the already finished portion of the bore. With a straight start, the drill cuts a straight hole.

The straight start is assured by a precision bushing that usually fits tight against the end of the workpiece. Gun drilling specialists at Eldorado Tool & Mfg. Corp., Milford, Conn., recommend that the bushing should be "no more than 0.002 in. larger than the drill size and should be discarded when it wears beyond 0.0005 in. oversize." This precision fit gives a controlled pilot in the bushing as the drill begins to cut; as the drilling progresses, the pilot shifts from the bushing to the hole. The drill cuts a hole the same size as the bushing.

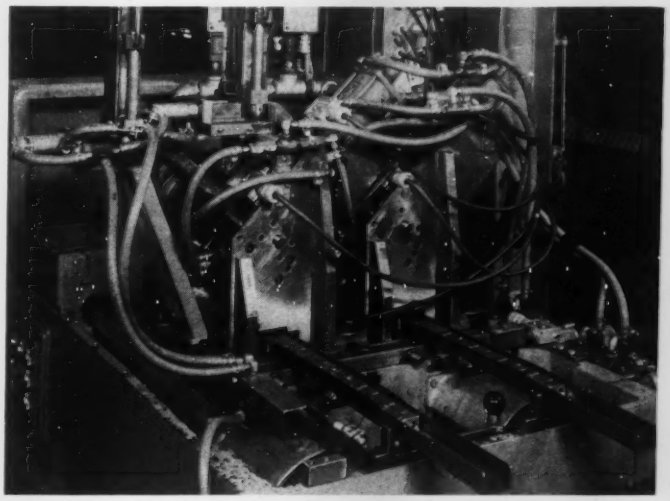
The cutting edge is usually made of carbide. In larger sizes, carbide tips are brazed on and two carbide guide surfaces (wear pads) are inserted on the drill. In the smaller sizes, the head is solid carbide.

Drill heads are brazed to a crimped tube shank. National Twist Drill & Tool Co., Rochester, Mich., also makes a detachable cutting head in the larger sizes (over ½-in.) that allows for quick tool changing.

Transition — The influence of shallow-hole jobs is altering some tool design concepts. When the process got its start on rifle barrels, the work was rotated and the drill held stationary. With shorter holes, shank whip is no problem, and the drill can be rotated. Cutting results are identical either way.

William J. Kallio, chief product engineer, Chicago-Latrobe, Chicago gun drill manufacturer, feels it may be advisable to add a third wear pad that will add further stability and might act as a vibration dampener.

Sizes — Most authorities agree that the practical diameters for gun drills are ⅛ to 2½-in. In some special cases, gun drills have been made as large as 4 in., but trepanning normally should be con-



Gun Drill Solves a Problem

FOR YEARS, one of the tough machining jobs at Trabon Engineering Corp., Solon, O., has been the drilling of piston bores in the company's central lubricating system metering valves. The holes range from ¼ to ⅝-in., and can have a diameter-length ratio of 15 to 1.

Pistons must move in the bores. So size, straightness and surface finish all are important. It used to be tedious with a twist drill; drilling had to be followed by reaming, broaching and honing.

Short Cut—Several years ago, engineers at Trabon, out to eliminate one or more of these operations without sacrificing hole quality, modified an Avey drill press with a high speed Master gear unit and tooled up with gun drills.

Success was immediate. Reaming was eliminated entirely. Production jumped to 50 to 60 parts an hour. Hole straightness, a pest before, no longer was a problem.

Automate—The next logical step has just been completed. Using a 2-spindle, precision boring machine built by Bryant Chucking Grinder Co., Springfield, Vt., (photo above) Trabon engineers have designed and built up tooling for automated gun drilling.

Since feed and speed will be the same as for the operation on the Avey, the production gain comes from automation and the two spindles. Output will be at least 120 parts an hour.

Cycle—Stock for the parts is cold rolled B1112, sawed into blocks. The blocks are dropped into two vertical gravity-feed hoppers, one over each machining station.

Blocks feed from the hoppers into air chucks that hold and locate them for drilling. After the drilling is completed and the tools withdrawn, the blocks drop into two discharge chutes that carry them out of the machine.

Coolant is fed through the drills at about 700 psi to cool the cutting tip and to flush out chips.

sidered for the larger sizes.

The length of a gun drill can be anything up to about 325 times its diameter.

Alignment—This is probably the most critical single factor in gun drilling: The alignment between the spindle and the starting bushing. Frank Sanders, at Continental Motors Corp., Detroit plant, says this factor was their biggest hurdle in modifying an Ex-Cell-O precision boring machine to gun drill valve guide and tappet holes in 4-hp engine blocks.

In a booklet describing the process, Eldorado engineers warn: "It is absolutely essential that alignment of the machine and drilling setup and of the tool be checked, adjusted and maintained. A surprising number of job difficulties have occurred as a result of machine and fixture misalignments. Never take alignment for granted."

Machines—In addition to tailored gun drilling machines, many standard machine tools can be adapted to gun drilling. Most gun drilling is done on precision boring machines, but manufacturers also are converting drill presses, lathes and turret lathes, horizontal boring machines and milling machines.

The importance of holding alignment suggests that the machines must be rigid and vibration-free to prevent original alignment from being lost.

Feeds—Mechanical, air or hydraulic feed systems can be used with equal success. In any case, the feed must be positive and must be easily regulated. A good starting point for feed is 0.0005 in. per revolution. For small drills, the feed can drop to 0.0002 ipr. Even with large drills, it should be held under 0.002 ipr, at least on steel.

Speeds—Another factor that will influence your selection of a machine for gun drilling: Speeds normally are high. Free machining metals, like low-carbon steel and many nonferrous metals, can be cut at 2000 sfpm with good tool life.

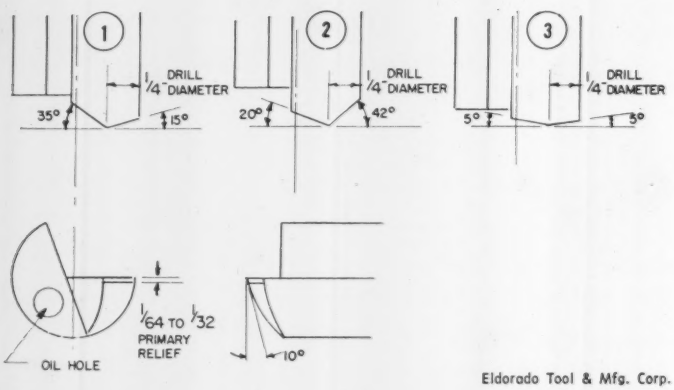
To get such speeds, you may have to add a high speed head and spindle to the machine.

Reaming—The gun drilling principle also is used for finishing holes where size, straightness, surface finish or concentricity is a must. At Chrysler Corp.'s Mound Road engine plant in Detroit, a W. F. & John Barnes transfer machine is being used to gun ream 0.015 in. on a side of the four intake and four exhaust valve guides. On the same tool, a separate cutter head machines the 45-degree valve seat.

The tools produce a hole concentricity that needs no further finishing operations.

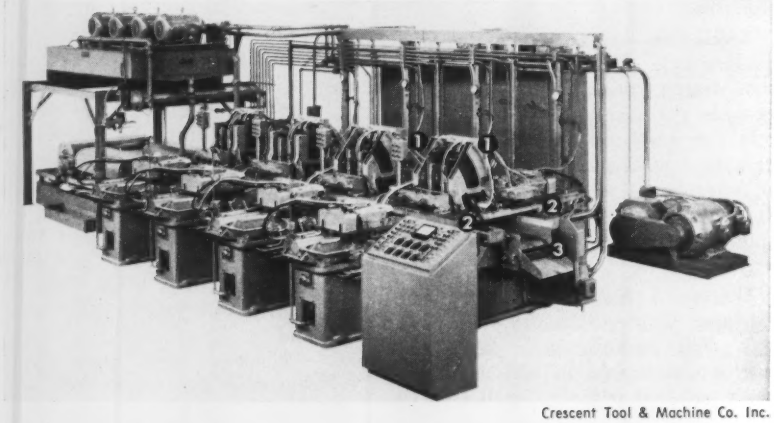
Most gun reamers are similar to gun drills but use a narrower cutter and flute. One recently announced by Star Cutter Co., Detroit, has two flutes on a solid carbide tip.

Mark these down as the earmarks of a job to be considered for gun drilling or gun reaming: Tight limits on location, bore straightness, concentricity, size or surface finish; jobs where gun drilling might eliminate one or more hole finishing operations; jobs where conventional tooling may cause finishing prob'ems with work hardening materials; holes more than six diameters deep.



Eldorado Tool & Mfg. Corp.

These suggested grinds for gun drills can be used as basic starting points. Although each job should be checked for best geometry, grind No. 1 has proved itself in a large number of jobs. Grind No. 2 gives good chip formation and size and straightness control; it can be used for jobs of medium difficulty. Grind No. 3 is for extremely ductile materials



Crescent Tool & Machine Co. Inc.

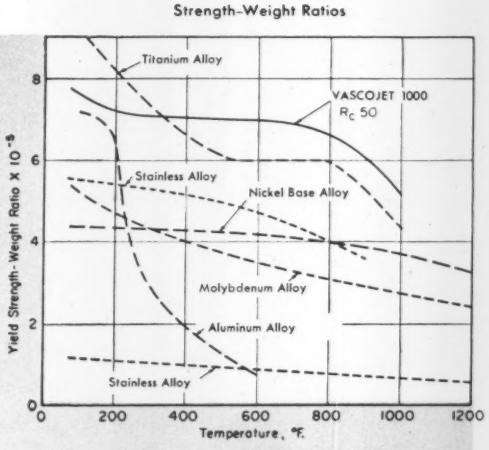
1 Hoppers 2 Chip Conveyors 3 Part Conveyor

This four-station transfer machine gun-drills 0.296-in. diameter oil holes through 18-in. automotive transmission shafts. The material is SAE 5145, hardened to 31 Rockwell C. Each of the four stations drills two parts at a time; opposed heads drill the holes from both ends of the shafts. Spindle speed is 5400 rpm, feed is about 4 in. a minute. Coolant pressure is 950 psi. The setup turns out 360 parts an hour at 80 per cent efficiency

VASCOJET 1000

A new ultra high strength steel

presenting the highest strength-to-weight ratio at elevated temperatures *of any engineering material*



Now available for aircraft, ordnance and industrial applications, VASCOJET 1000 is a moderately-priced ultra high strength alloy steel possessing extraordinary properties. ● This steel is stable to 1000°F, surpassing in strength-to-weight ratio the best titanium and hardenable stainless alloys. It is of great importance for super-speed aircraft structures and skins, high-temperature fasteners and rotors. ● VASCOJET 1000 in normal temperature service at strength levels of 260,000 to 290,000 psi has the toughness, transverse ductility, fatigue strength* and freedom from residual stress that make it ideal for heavy-duty applications. Typical among these are aircraft landing gear, air frames, engine mounts, arresting gear and other critical components; fasteners, springs, pressure vessels; truck, train, airborne and portable equipment parts. ● VASCOJET 1000 is available in plate, sheet, strip, bars, extruded shapes, wire and forging billets. Write for comprehensive technical data.

*highest of any material reported

Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

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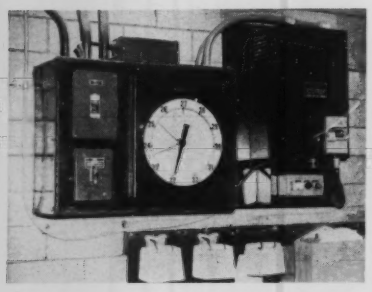
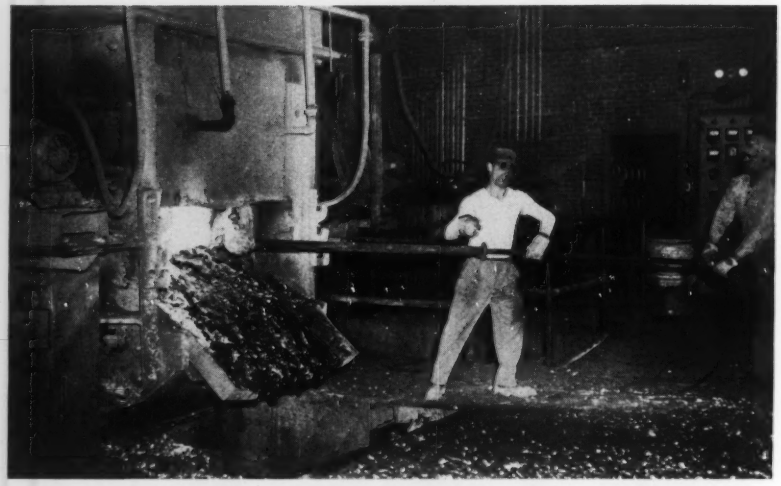


In the melter's office at Copperweld Steel Co.'s East Melt Shop, a recording pyrometer (left) and thermocouple circuit monitor (right) operate together to obtain accurate steel melting temperatures. The monitor automatically checks and restores electrical continuity of the thermocouples and thermocouple circuits



Furnace operator and helper insert a platinum immersion thermocouple into one of Copperweld's electric furnaces. Use of the circuit monitor has increased thermocouple life

Inspector for Immersion Thermocouples

Monitoring instrument checks thermocouple circuits. It re-establishes correct resistance to maintain accurate metal temperature control in electric furnaces

COPPERWELD Steel Co., Warren, O., is cutting melt shop operating costs with a system which pinpoints thermocouple circuit troubles without manual inspection. It has lengthened the useful life of thermocouples an average of 40 per cent.

Heart of the system is a "Restorer," a thermocouple circuit monitor manufactured by Peerless Electric Co., Warren, O. It operates with a Brown recording pyrometer to maintain accurate furnace temperatures. (On some bearing steels made by Copperweld, temperature specifications are extremely tight.)

Operation—Each time a furnace operator takes a temperature reading, the device checks the conductivity of thermocouples and circuits leading to the pyrometer. It detects excessive circuit resistance caused by loose, dirty or corroded connections and cracked thermocouple faults — and corrects the fault.

A typical measurement follows this pattern: The furnace operator connects a platinum immersion thermocouple to a circuit outlet near the furnace. When he inserts the long handled couple into the furnace, the pyrometer in the melter's office picks up the thermoelectric voltage and begins to record.

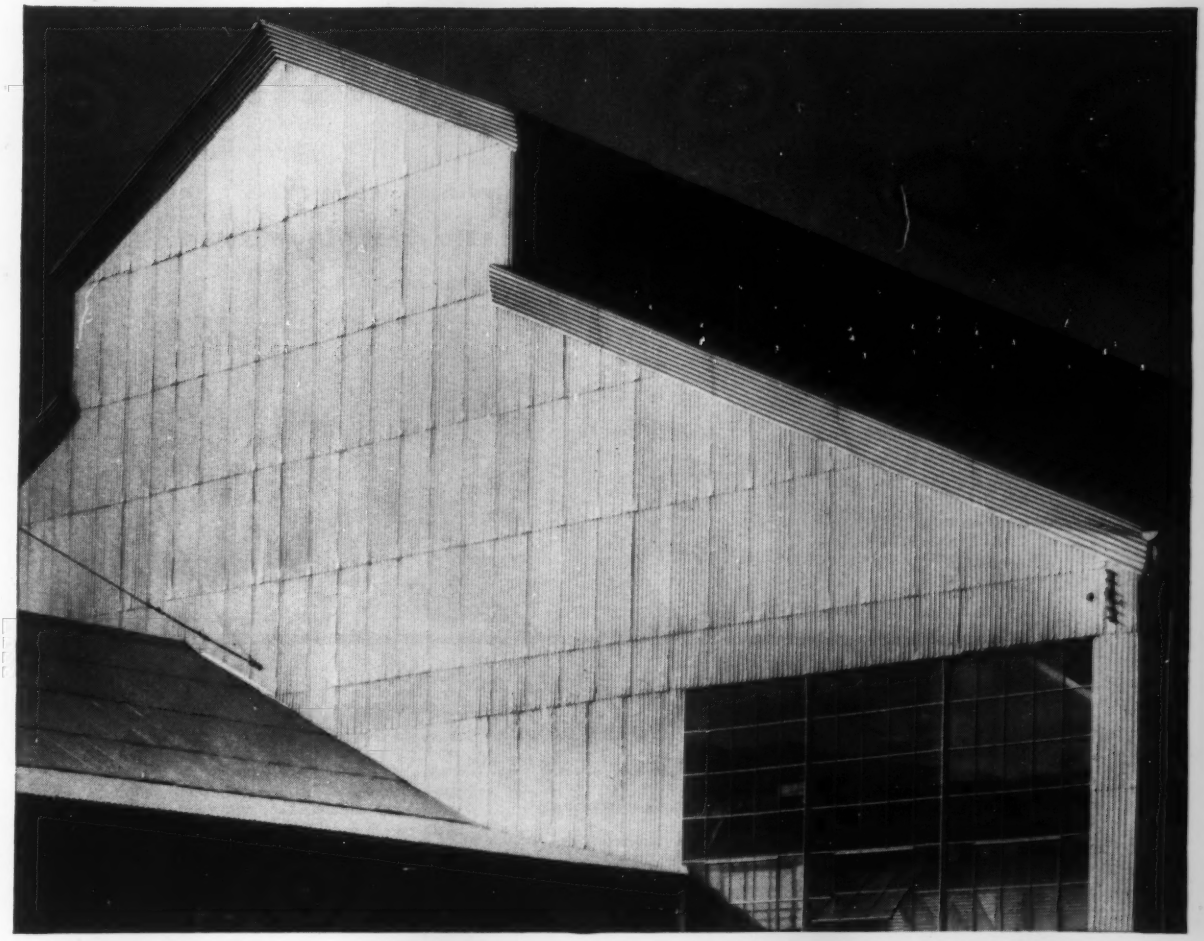
Check — When the pyrometer chart begins to move, the Restorer automatically disconnects the pyrometer circuits from the thermocouple circuit. It then sends a quick electrical impulse—about 400 volts—across the thermocouple circuit. This assures a continuous circuit.

The operation takes about 1 second. After the checkup, the pyrometer again records furnace temperature. Signal lights at the furnace show when a measurement is being made.

Shorts—Copperweld's instrument chief also uses the Restorer to check for shorts. He energizes it with a key operated switch when no measurement is being taken. All circuits should be open. If current flows, one of the circuits is shorted.

The repeated voltage impulses used in testing appear to have an annealing effect on the thermocouple wire. In one case, a cracked wire was fused by the electrical charge.

Net effect of the Restorer has been to extend the average life of each platinum couple from 25 to 35 immersions.



ACP ANNOUNCES A NEW CHEMICAL PROCESS

that develops an excellent zinc phosphate coating on mill passivated galvanized stock

ACP research and development has solved another perplexing problem for its customers in the galvanizing industry—the formation of a good zinc phosphate coating on mill passivated galvanized stock. It offers excellent paint bonding characteristics. The treatment is performed in a 5-stage power spray washer or dip line normally used for coating nonpassivated stock.

If you are having trouble getting a good zinc phosphate coating on your galvanized stock, consult us. We'll be glad to send you descriptive literature or have a technical representative call.

AMERICAN CHEMICAL PAINT COMPANY, Ambler 19, Pa.

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CHEMICALS ACP PROCESSES

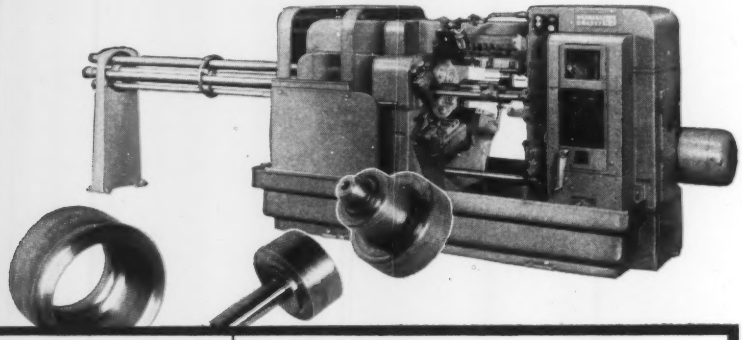
New Chemical Horizons for Industry and Agriculture

Warner & Swasey's cost-cutting Automatics boost production for Thor Power Tool Co.

Look at these typical time and cost savings delivered by Warner & Swasey 5-Spindle Automatic Bar Machines at Thor Power Tool's Aurora, Illinois plant.

AUTOMATIC BAR MACHINES
1¼" Bar Capacity
1¾" Standard Capacity
2¼" Oversize Capacity

AUTOMATIC CHUCKING MACHINE
6" Swing



Reduction Gear Blanks

Savings pay for several new machines!

Large variety required—in lot sizes of 150-1500 pieces. Material — 8460 Steel.

Previous method — 2 single-spindle automatics, running continuously.

NOW — One Warner & Swasey 5-Spindle Automatic does complete machining in equivalent of 4 days a week.

Lock Collar

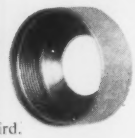
Slashes machining time on longer runs!

Quantities — 20,000 - 30,000 pieces.

Previous method — Run on conventional multi-spindle automatics in 75 seconds.

NOW — on Warner & Swasey 5-Spindle Automatics parts made in 27 seconds!

Thin Walled Protection Nut

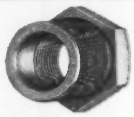


Combines operations at high removal rate!

Previous method — Three operations — rough turned, relief cut made in second operation, Class 3 threads hobbed in third. Cost of last step alone ran 20 cents per part.

NOW — finished in one operation in 132 seconds on Warner & Swasey 5-Spindle Automatic.

Reducer Bushing



Cuts Class 4 threads in same operation — costs reduced 8.5 to 1!

Previous method — Threads milled, following rough forming on single-spindle automatic.

NOW — Complete machining finished on Warner & Swasey 5-Spindle Automatic in one operation in 27 seconds!

Sanding Pad Nut

One machine does work spread over 3 departments!

Problem — To thread part at perfect 90° angle to outside face, and hold concentricity.

Previous method — Part machined in 3 different departments. Difficulty was experienced in holding piece in fixture for knurling.

NOW — Thread tapped into bar stock and balance of cuts made, including knurling, in one operation on Warner & Swasey 5-Spindle Automatic.

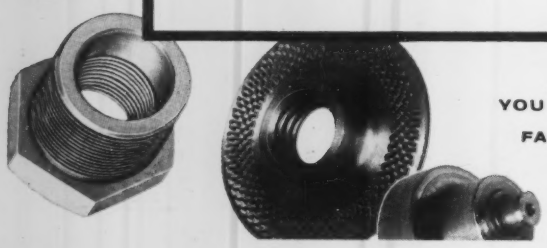
Drive Shaft Impact Spindles

Accuracy and rigidity deliver 4 to 1 savings!

Material — Super tough rivet set alloy, especially made for Thor.

Previous method — Roughed on single-spindle automatic, straddled to length on turret lathe — both machines running at half speed.

NOW — finished for grinding in single operation on Warner & Swasey 5-Spindle Automatic running at full speed.



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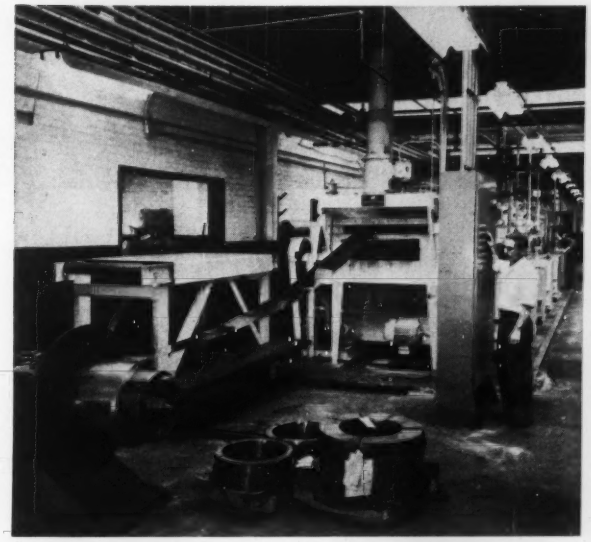
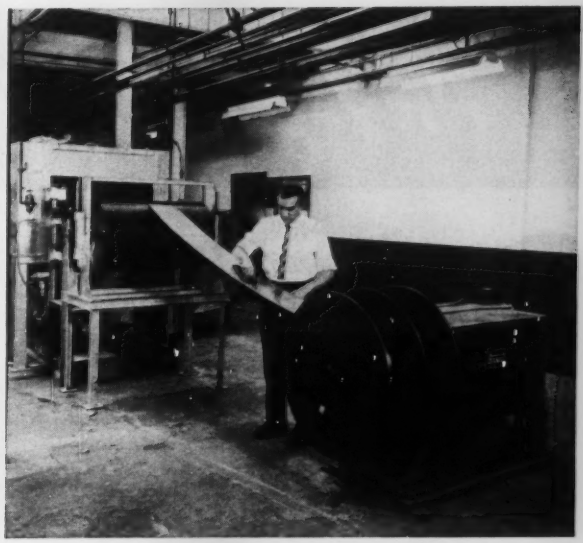
PRECISION MACHINERY SINCE 1880



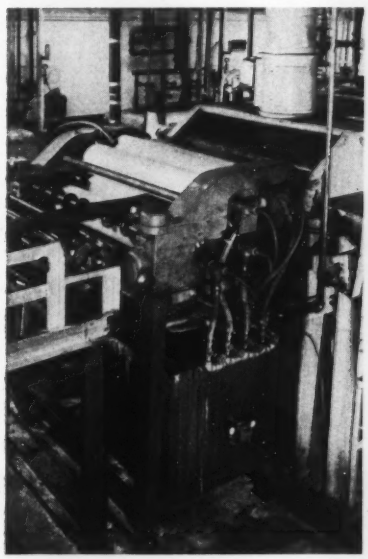
Heavy coil of strip feeds into 75-ft treating machine



Inspector checks coated strip as it winds onto recoiler

Phosphating Machine Coats Strip

Automatic unit prepares coiled strip or sheets, treats and dries them. Installed in an experimental laboratory, it can simulate any production line condition



Coatings are applied by roller coating units or automatic spray

WITH the trend to automated cold forming, officials at Parker Rust Proof Co., Detroit, foresee the time many fabricators will purchase coil stock that is phosphate coated at the mill.

Backing up that prediction, Parker has opened a new laboratory that is equipped to treat strip and sheets with phosphate at high speeds. The coatings have two functions: They serve as a lubricant in cold forming and as a corrosion preventive paint base.

Pilot Plant—The service is being offered to steel plants that are willing to ship production lots of stock or parts to the lab. Engineers in the lab will determine the proper treatment and apply suitable coatings with automated equipment under production conditions.

Parker engineers designed the processing machine to handle coils up to 18 in. wide, weighing a maximum of 3000 lb.

Sheet stock can be up to 36 in. in width.

Treatment—At an average production line pace, the stock travels through a cleaning solution and two heated water rinses, then it is sprayed with a phosphate coating at two stations.

A cold water rinse is followed by a conditioned rinse or a lubricant coating. A drying oven is the last stop. Squeegee rollers remove excess chemicals at each treatment zone.

Flexible—The unit which applies the cold forming lubricant can be removed from the line and replaced with a disc type conveyor or an alternate roller coater for application of special coatings or rinses.

This unusual laboratory already has helped manufacturers solve production problems in forming steel for construction, in forming polished stock in the automotive and appliance fields and in the treatment of valve rocker arm stock.

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- √ Wheel Diameters
- √ Torque Ratings

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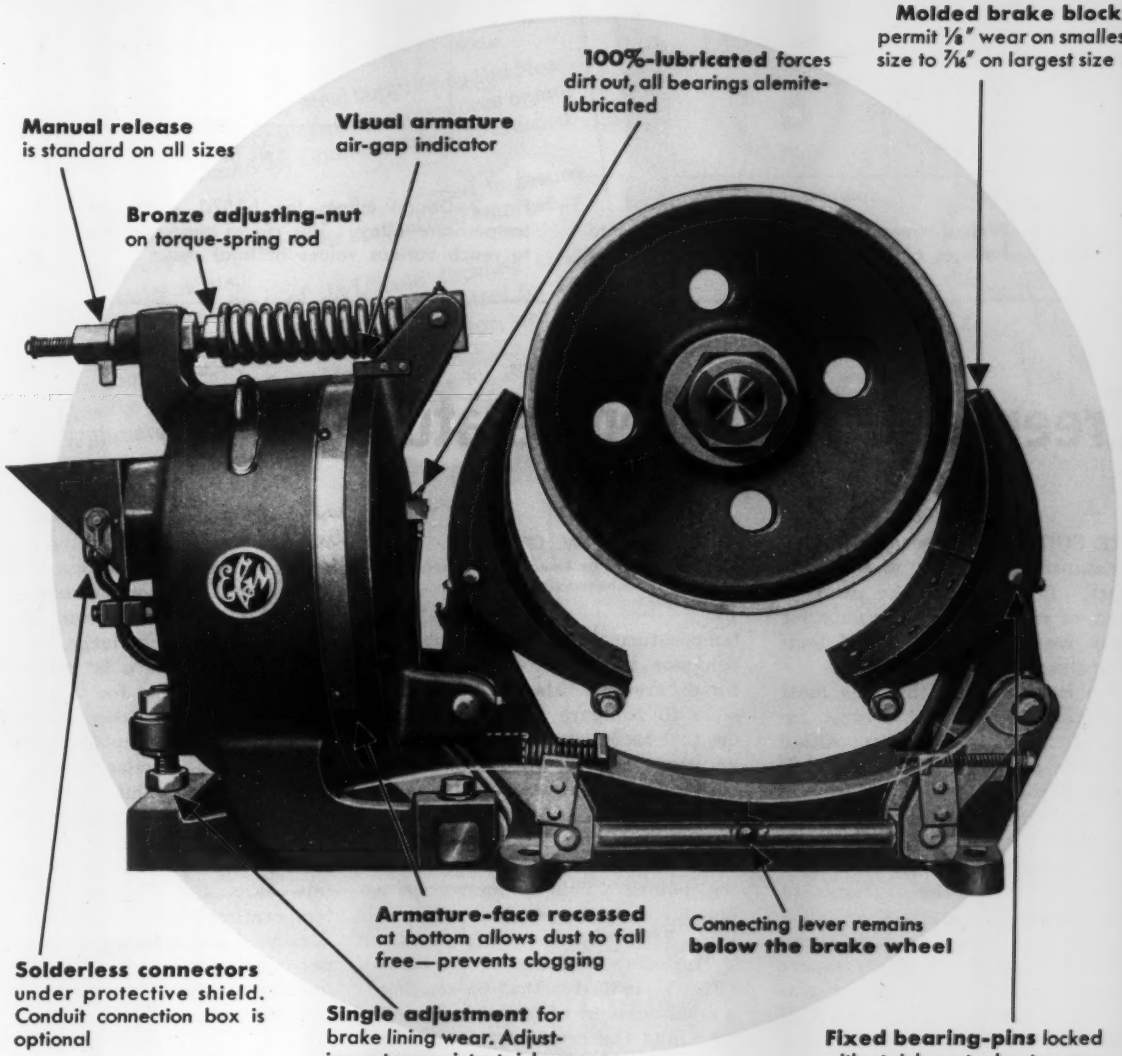
THE ELECTRIC CONTROLLER & MFG. CO.

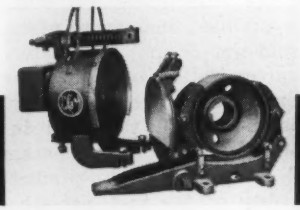
A DIVISION OF THE SQUARE D COMPANY

CLEVELAND 28 • OHIO

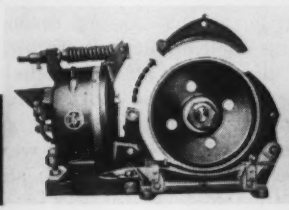
EC&M "WB" BRAKES RATE #1


Molded brake blocks permit 1/8" wear on smallest size to 7/16" on largest size
100%-lubricated forces dirt out, all bearings alemite-lubricated
Manual release is standard on all sizes
Visual armature air-gap indicator
Bronze adjusting-nut on torque-spring rod
Armature-face recessed at bottom allows dust to fall free—prevents clogging
Connecting lever remains **below the brake wheel**
Solderless connectors under protective shield. Conduit connection box is optional
Single adjustment for brake lining wear. Adjusting-nut screws into stainless steel, threaded bushing in magnet-case
Fixed bearing-pins locked with stainless steel set-screws reduce number of lubrication points

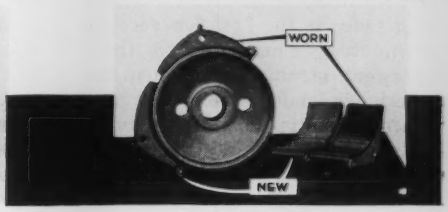
SIMPLIFIED MAGNET REMOVAL



SHOES AND LINERS EASILY REMOVED



ACCURATELY FORMED BRAKE BLOCKS



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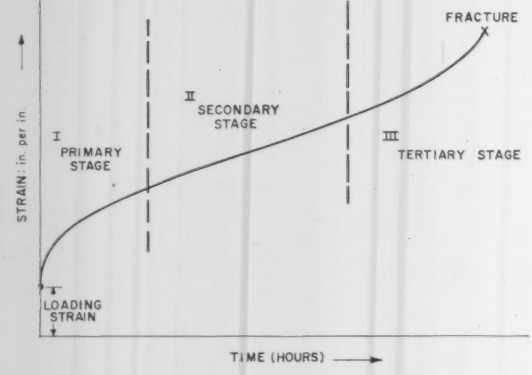


Fig. 1—Typical creep curve showing division into so-called stages of creep

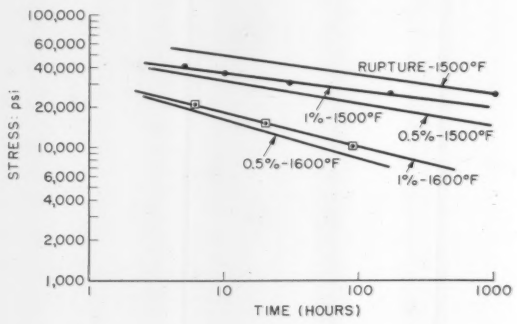


Fig. 2—Design curves for J-1570, a typical high temperature alloy. The curves represent the time to reach various values of total strain

Creep and High Temperature Alloys

By R. W. GUARD
General Electric Research Laboratory
Schenectady, N. Y.

THE SCIENCE of creep and creep resistance is becoming increasingly exact. It can guide the development of materials having superior creep resistance at elevated temperatures.

We have learned that the most important thing about a creep resistant alloy is not composition alone or heat treatment alone. It is the structure which the combination of composition and heat treatment produces.

To understand what this "science" can do for the developer of creep resistant materials, we must have an idea of how creep deformation takes place. If you compare the deformation behavior of materials under constant stress at high and low temperatures, the obvious difference is the amount of time-dependent strain which is produced. If a material remains under load for a long time at low temperatures, most of the strain takes place in the first few seconds or minutes. There is little time-dependent strain. But when the material is loaded at elevated temperatures, initial straining may be fairly low, and time-dependent strain can be large.

Homolog — The temperature at which the change from the low temperature to high temperature behavior takes place is different for different metals. But it is possible to compare different metals on the basis of homologous temperatures. If we divide the range between zero degrees and the melting point into 100 even intervals, we can compare different metals at the same fraction of their melting point. This is known as a homologous temperature scale (Fig. 3).

The shape of the creep curve (Fig. 1) indicates that on loading, a small amount of initial strain occurs, and the remainder is a function of the time. The designer is interested in a number which he can use in a formula for deciding what sort of section size he should use to support a given load. It is possible, in the case of creep, to set up limiting design stresses if you know what strain can be tolerated before the part fails to function properly.

Design Curves—The best way to present these is as a graph showing the relationship between the time to reach a specified amount of total strain as a function of the stress. These are design curves (Fig. 2). In some cases, the amount of creep that can be tolerated is extremely large, so that rupture or fracture is really the limiting strain, and for this reason the design curves also should include the time to rupture.

Recently, a correlation has been proposed which would save considerable time in approximating long-time creep results from short-time tests by trading time for temperature (Fig. 4). This is the time-temperature parameter. Its accuracy allows roughly a 10 to 15 per cent error in the stress for long life to be approximated from short-time tests.

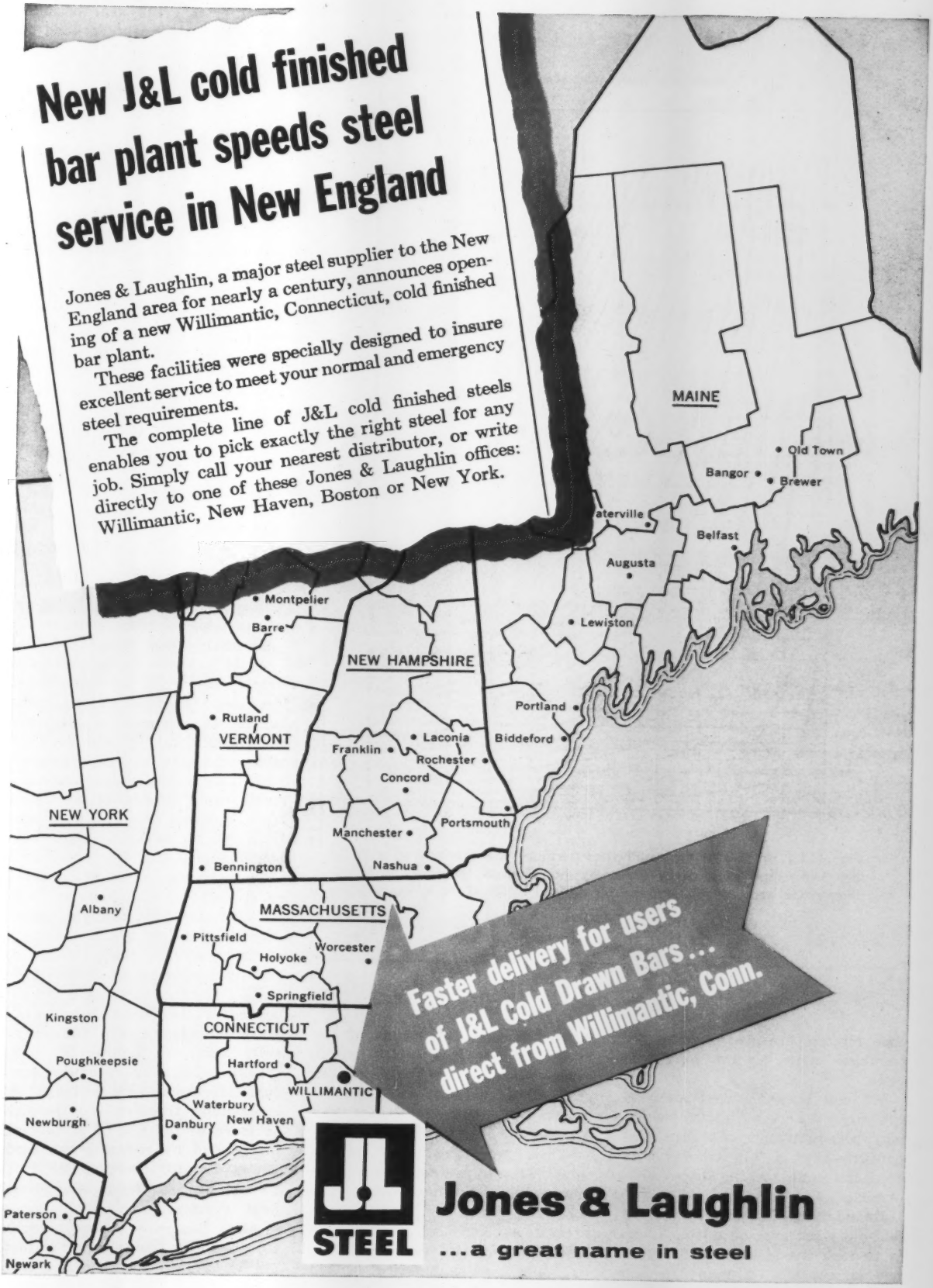
Stability—The only requirement is that the alloy should show reasonable stability in the temperature range in question. (The second phases present should not dissolve; the material should not recrystallize; and severe overaging should not occur.) Some amount of precipitation or aging can be tolerated simply by adjusting the constants to fit the data in the short-time tests. The parameter will not allow us to predict the ductility of the material—that is, the strain to fracture. Its depend-

New J&L cold finished bar plant speeds steel service in New England

Jones & Laughlin, a major steel supplier to the New England area for nearly a century, announces opening of a new Willimantic, Connecticut, cold finished bar plant.

These facilities were specially designed to insure excellent service to meet your normal and emergency steel requirements.

The complete line of J&L cold finished steels enables you to pick exactly the right steel for any job. Simply call your nearest distributor, or write directly to one of these Jones & Laughlin offices: Willimantic, New Haven, Boston or New York.



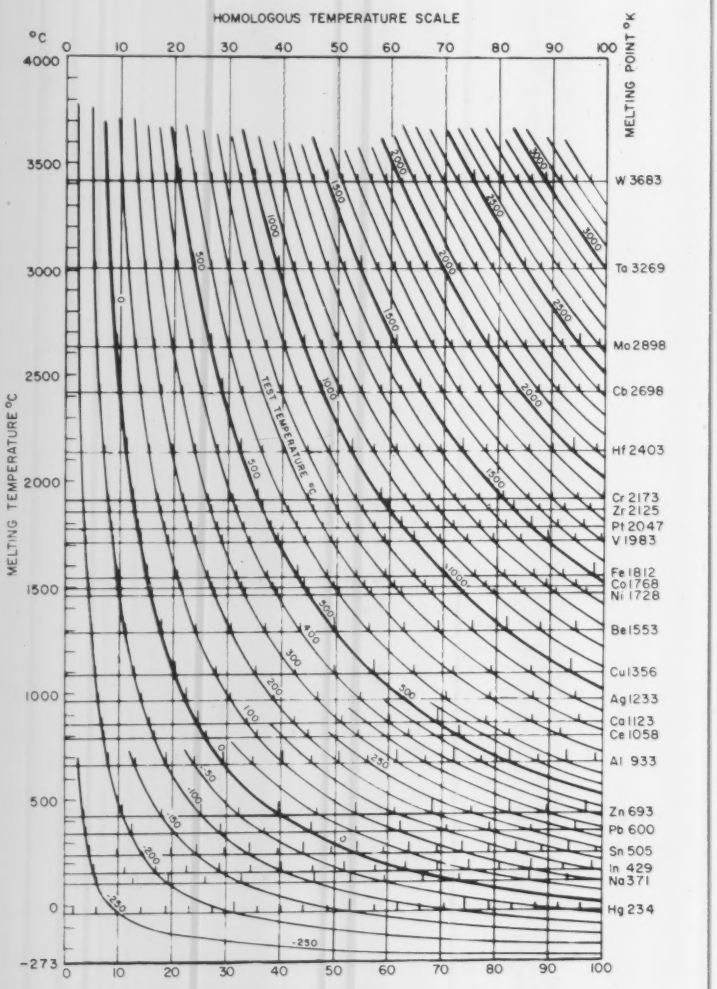


Fig. 3—Intersection of the melting temperature line (horizontal) with the test temperature curve gives the homologous temperature on the vertical scale of this nomograph devised by Dr. J. H. Westbrook

ence on temperature must be determined with a few long-time tests.

We can use this parameter to compare different alloys which may be useful over different temperature ranges. It acts as sort of a screening test in alloy development.

Boundaries—The easiest way to find out what goes on during creep is to look inside the metal. Most metals consist of many grains with different orientations of the crystal lattice. In a typical metal, grains occupy more than 99 per cent of the volume, while the region near the boundary is less than 1 per cent.

When creep takes place at high temperatures, boundary flow becomes especially important. The familiar slip lines which were present at low temperatures disappear; the grains become divided by many subboundaries within them, and a great deal of flow takes place in the neighborhood of the boundary itself. For this reason, understanding more about the origin of subboundaries, their effect on creep and the importance of boundary flow in general has been one of the goals of the people studying creep behavior.

Grains—While the behavior of the grains themselves and of the boundary regions are not completely independent, it is possible to consider them separately and to look at each one by examining the amount of flow that takes place in each of these regions as a function of stress and temperature. Fig. 5 shows a typical creep curve in which the total creep has been divided separately into two sources: 1. Flow which takes place within the grains. 2. Flow which takes place near or in the grain boundaries.

The phenomenon of grain breakup and grain subboundaries has also received considerable study. It is closely associated with the process of softening or recovery of mechanical hardening, such as occurs in annealing.

Summary—Our picture of how a metal behaves during creep is roughly this: As the temperature increases, the flow in the grain boundaries increases rapidly, and the grains break up into small regions separated by subboundaries. What controls creep resistance seems to be related to what controls boundary flow and what controls the formation of these subboundaries.

The tertiary portion of the creep curve is of special interest (Fig. 2). We are beginning to understand something about this type of behavior even though it is not strictly a problem of creep resistance. During this part of the curve, cracks often form along grain boundaries, and failure results from a joining of these cracks, causing intergranular fracture. If the failure is due to intergranular fracture, it is possible to increase the life of a material under load by reducing the tendencies toward intergranular fracture by proper alloying and proper heat treatment.

Alloy Design — These observations on how the behavior of metals is affected by structure have

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RUST VETO M.P.—multi-purpose base. Mixes with water, solvent, oil. Dependable, economical and fire safe.

RUST VETO 266—combination rust preventive, cleaner, fingerprint neutralizer. Displaces water, residue, acids. For temporary production-line protection.

RUST VETO 377—a polar type preventive for long term indoor storage. Withstands 30-day humidity cabinet test at 100°F.

RUST VETO 344—produces fast drying polar-active asphaltic film. Used for long-term outdoor protection of metal.

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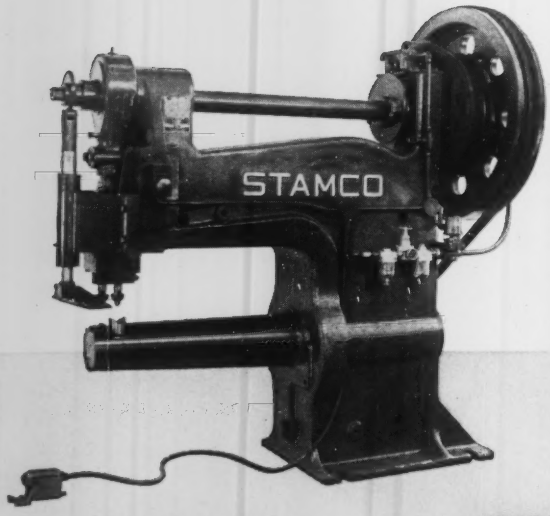
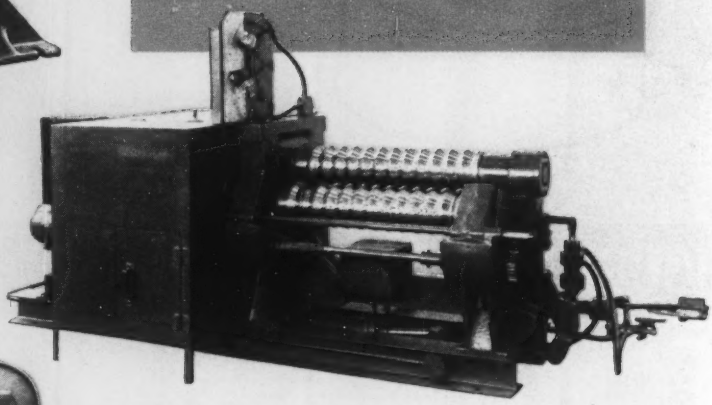
Ready to give you on-the-job service . . .

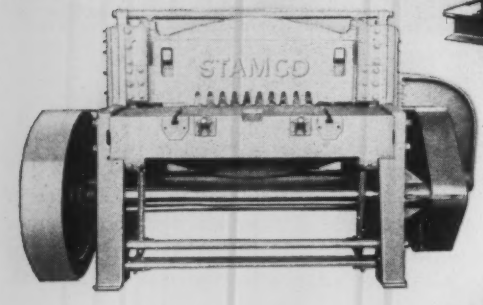
for roll corrugating and culvert forming, see Stamco



Stamco high duty culvert punch and riveter equipped with air operated friction clutch brake and cam stripper.



Stamco 8 ga. culvert curving roll with air operated endgate and motorized roll adjustment.



Stamco 8 ga. x 36" corrugated shear.

Stamco #6A high speed corrugator.

Stamco, Inc., New Bremen, Ohio,

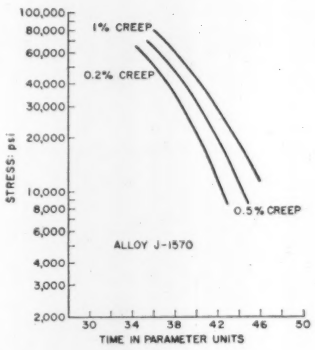


Fig. 4—The Larson-Miller parameter permits the plotting of data at several temperatures on the same plot. Short-time points at a high temperature can be used to estimate long-time points at a lower temperature for the same stress. The graph shows time in parameter units for high-temperature alloy J-1570 (28 Ni, 37.5 Co, 20 Cr, 2 Fe, 7 W, 4.2 Ti, 0.2 C) to reach a given creep strain at different stresses. Parameter units are determined by the formula, $P = T (20 + \log t) \times 10^{-3}$, in which T is the Rankine (absolute Fahrenheit) temperature and t is the time in hours

many practical consequences in alloy design. Let's consider first the general structure for austenitic high temperature materials such as Nimonic 80 or Inconel-X. They consist primarily of a solid solution matrix (in this case nickel-base), and dispersion of second phase particles. These can usually be divided into two groups: 1. Carbides containing metals such as chromium, iron, molybdenum, tungsten. 2. Intermetallic compounds formed between the matrix elements, such as Ni_3Al or Ni_3Ti.

The most important elements that can be added to nickel and nickel-iron-cobalt alloy to strengthen the matrix by solid solution seem to be molybdenum and tungsten with some slight effect from titanium and aluminum. In alloying the matrix for solid solution strength, it appears that the most important things are: 1. Preventing the recovery of mechanical hardening. 2. Preventing the formation of subboundaries and the resulting loss in strength. This means adding to the matrix primarily those elements which raise the recovery temperature.

Second Phase — Appreciable strengthening of the grains and of the grain boundaries can also be obtained by the proper dispersion of a second phase. At low temperature, it is not uncommon to find a second phase precipitating readily in the boundaries of the material, and by this means effectively blocking flow in the boundaries. But if flow is blocked too effectively, stresses can be set up which lead to intergranular fracture and low ductility.

In addition to the strengthening obtained by alloying in solid solution, it is possible by producing a fine dispersion of a second phase (a carbide or an intermetallic compound) within the grains to greatly increase elevated temperature strength. Examples are Ni_3Al in the Nimonic type alloys, Ni_3Ti in the J1570 type alloy and carbides in alloys like N-155 and S-816.

Dispersion—Grain boundary precipitation to reduce the amount of boundary flow requires a small amount of precipitate, much less than the amount required for strengthening the grains themselves. The amount in the grain boundary should be well dispersed and preferably should not overage. (Agglomeration will result in a loss in strength in this region.)

The two most important characteristics of a dispersion for the improvement of grain strength are fine size and great stability. By stability we mean: 1. Resistance to growth or agglomeration of the particles into large less effective masses. 2. Formation of less effective cellular precipitation, similar to pearlite in iron, where the precipitate occurs as lamellae.

Cracking—A study of fracture characteristics seems to indicate that in some materials fracture can result by the formation of cracks at contact places between particles. Examples of this have been observed in the cemented carbides. For this reason, particle-to-particle contact is to be avoided, and in some cases precipitation is a better way of producing the second phase than powder metallurgy or some similar technique.

Flow within the grains themselves and flow at grain boundaries are processes which are not completely independent. This is true of the proper dispersion of second phases in the grain boundaries and the matrix. It marks the relationship between the proper dispersion of second phase and the proper amount of solution elements in the matrix. So it is not possible to set up the best dispersion and combine this with the best solid solution and get the highest strength in an alloy.

You have to allow for the interaction between particle hardening or dispersion hardening and the matrix. It is apparent that by

(*Please turn to page* 116)

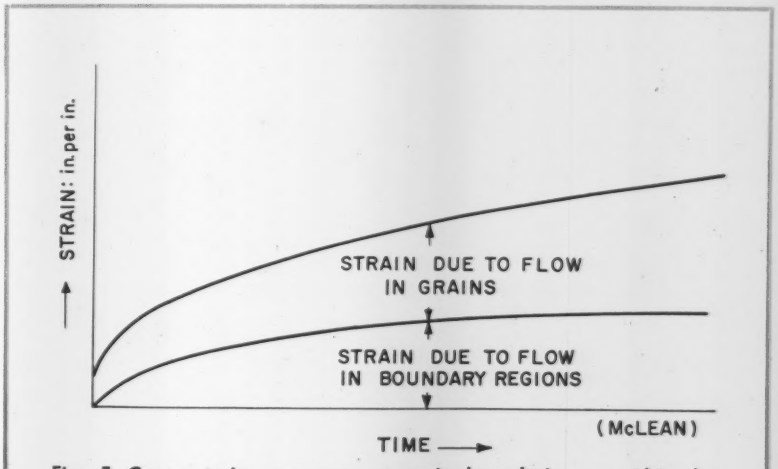


Fig. 5—Creep strain can occur at grain boundaries or within the grains. A typical division between the two sites is shown

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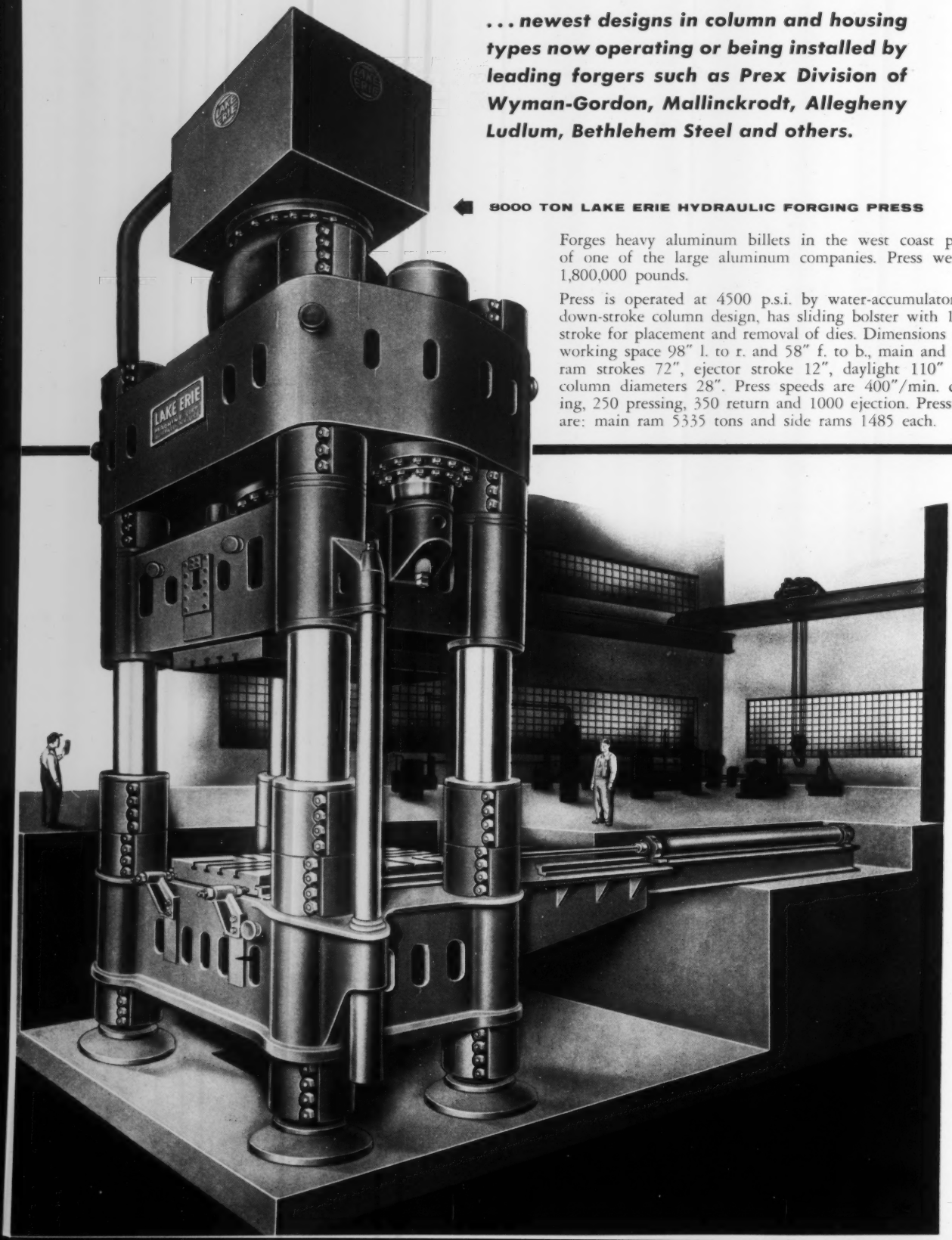

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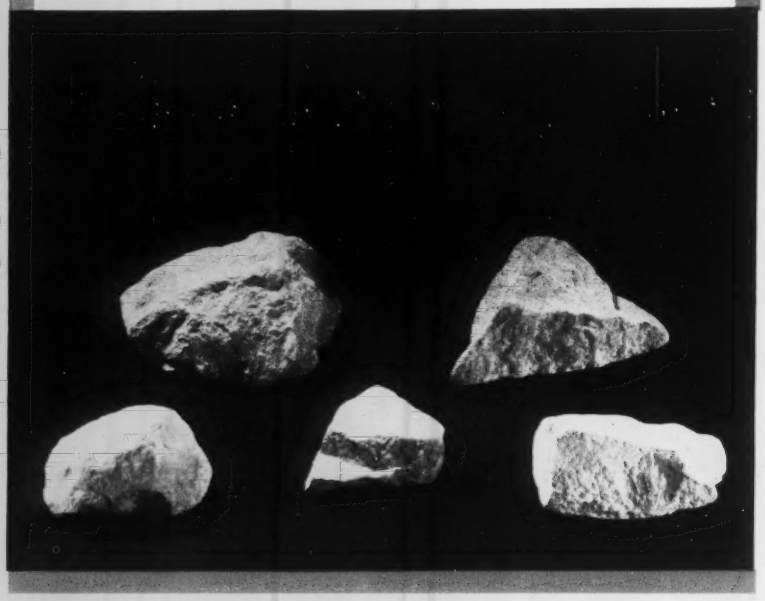

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HIGH TEMP ALLOYS . . .

(*Continued from page* 113)

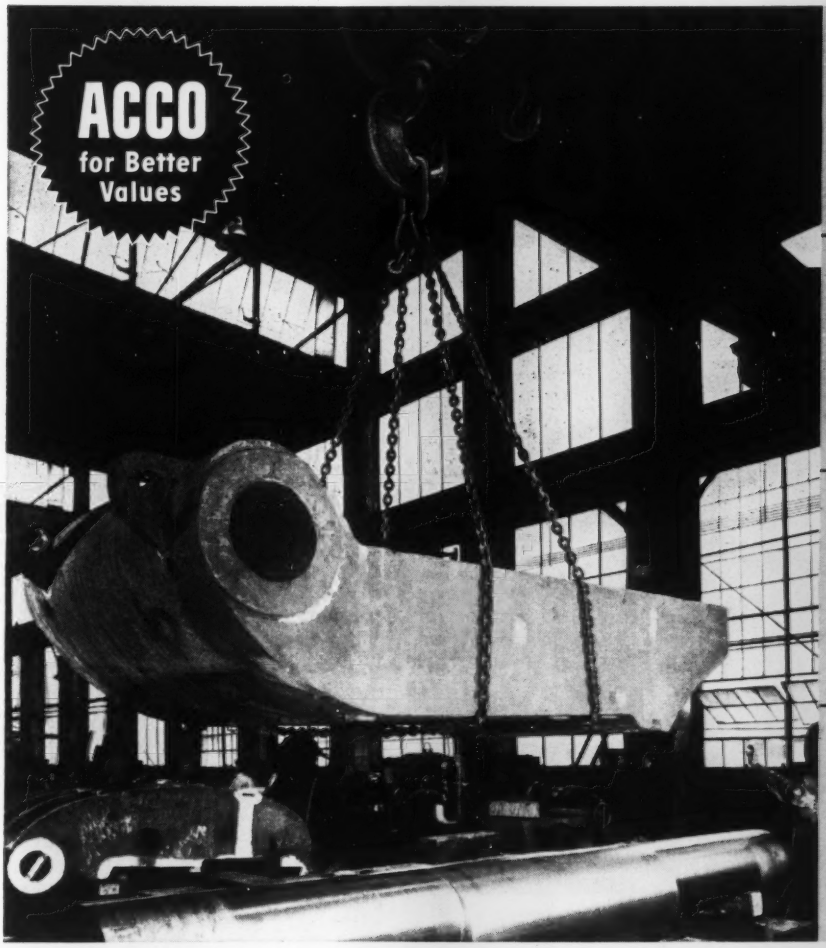
precipitating compounds of other elements than those in the matrix you can obtain a more stable precipitate. For this reason, it would be desirable to precipitate ternary or higher compounds.

Heat, Too—We can adjust the composition to get a grain boundary precipitate of the proper amount and stability and a proper amount of elements in solid solution. Or we can modify structure by changing the heat treatment.

If, for example, we precipitate compounds at a low temperature, there is a tendency for them to form at the grain boundaries in large amounts. But if we precipitate at an elevated temperature, within-grain precipitation tends to predominate. In addition, carbides in general precipitate at a lower temperature and go back into solid solution at a lower temperature than intermetallics.

Each Its Own—For this reason, it is necessary to choose different alloying elements to precipitate for alloys used in different temperature ranges. Alloys which are to be used at 1200 to 1500°F can utilize the strengthening effects of carbides. At higher temperatures, the precipitation of carbides is so rapid that they tend to overage and to lose their strengthening effect in long periods under creep conditions. At higher temperatures it is necessary to go to intermetallic compounds such as Ni_3Al and Ni_3Ti. These materials have a much higher precipitation temperature and are more likely to retain some of their strength in long time tests.

Since nickel base alloys melt at 2300 to 2400°F, it is not plausible to expect a nickel base material to have anything in the way of a binary precipitate phase which is stable much above 1750 or 1800°F. Solubility increases rapidly with temperature, and precipitation is not possible except beyond the solubility limit. If the temperatures are to be raised much above 1700°F, it may be necessary to go to alloys in which the amount of second phase is somewhat larger than in lower temperature materials. The presence of a properly dispersed second phase in excess



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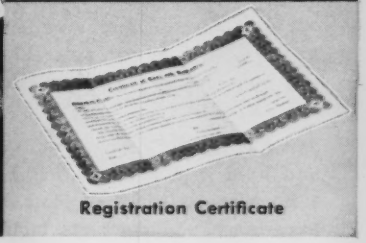

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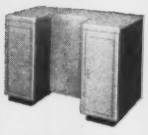
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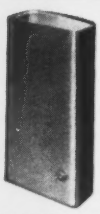
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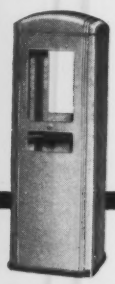
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or the amount which will go back into solution gives the strength.

Refractory Metals—On the basis of what we know about the creep behavior of materials in general, there seems to be no reason why the principles discussed cannot be applied to high melting refractory metals such as molybdenum, tungsten, vanadium and columbium. For example, if we knew accurately the phase diagrams of these metals, it might be possible to predict which elements would be most efficient as solution strengtheners, which would be most efficient as precipitation hardeners.

There seems to be good evidence that in the case of molybdenum, such elements as titanium, columbium and zirconium can have effective high elevated temperature strengthening effects: 1. Because of their solubility in the matrix which improves matrix strength and raises the recovery temperature. 2. Because of their ability to form dispersed phases.

Ahead—What we have learned about creep behavior emphasizes the importance of balancing composition to obtain the right amount of dispersed phase in the grain boundaries, the right amount of dispersed or precipitated particles within the grains themselves and the proper solid solution strengthening. It is a bit unfortunate that these factors are so interrelated that it is not always possible to sit down and design a specific alloy for a specific temperature. But metallurgists can often come rather close in selecting the proper composition and treatment for an alloy even before it has been made up.

On the basis of what we know, the outlook is not bright for an early increase in the operating temperature for nickel-iron-cobalt-base austenitic alloys, although these materials may possibly be satisfactory for use as high as 1800°F. Great strides may be made in the improvement of refractory alloy materials for use above 2000°F. Our knowledge of alloy principles has not been widely applied in this field.

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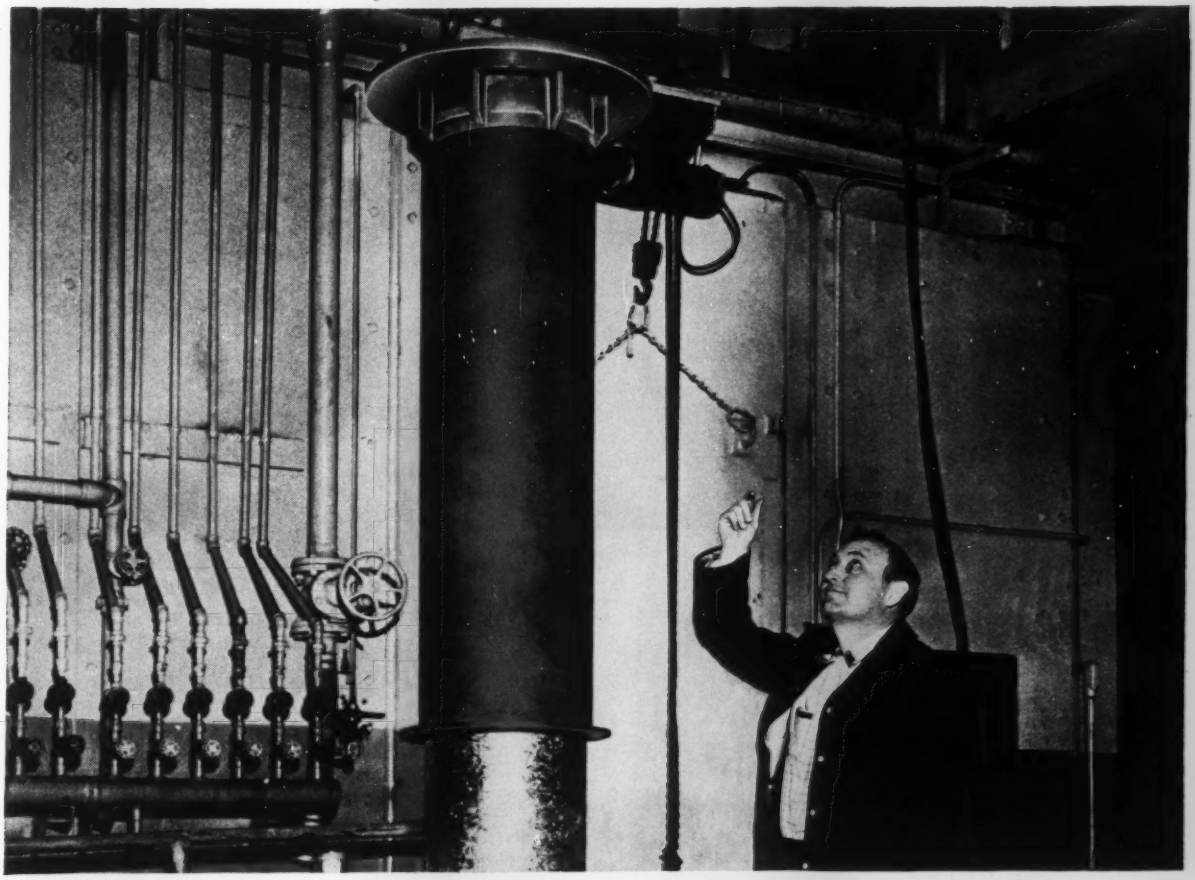
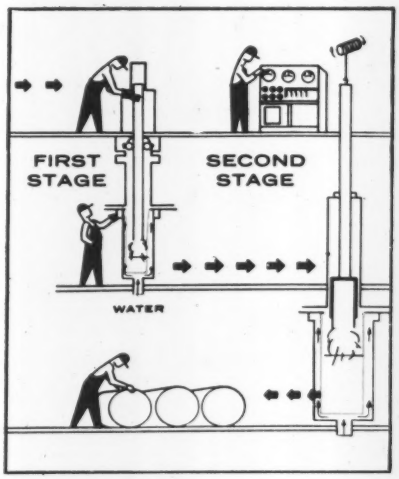


STRIPPING titanium ingot from crucible fabricated from Anaconda large-diameter seamless copper tube. During melting, the crucible is water cooled.

How Copper helps make superior Titanium Ingots



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Big Coil Springs

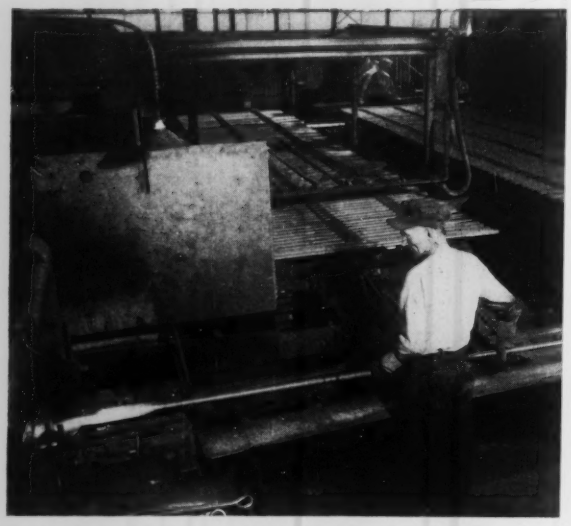
An Inside Story

AT ITS PLANT in Chicago Heights, Ill., Alco Products Inc. makes heavy coil springs. With the recent addition of automatic equipment, consumption of steel by the plant has shot upward (20,000 tons a year, compared with the former 12,000 tons). Production of freight car springs has doubled.

Tighter production control made possible by modern equipment has prompted the company to make a move unusual for the spring industry. Alco (formerly American Locomotive Co.) now guarantees its railroad freight car truck springs against breakage for ten years.

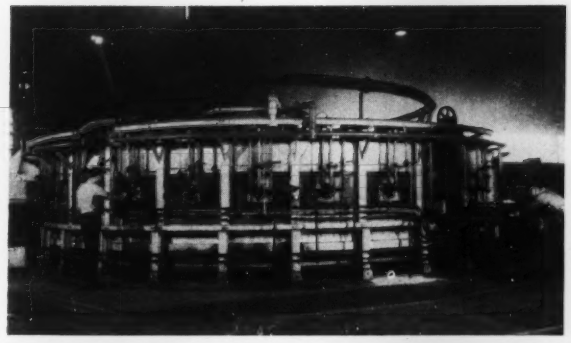
Pictures Speak—Some of the methods and equipment that stand behind the guarantee are illustrated in the picture sequence. The springs are all husky specimens; the company makes them in a range of 6 to 200 lb, using flat, square and round stock.

Manufacture starts with the purchase of carbon and alloy steel bars, color coded for identification. Bars are cut to length. Next . . . .

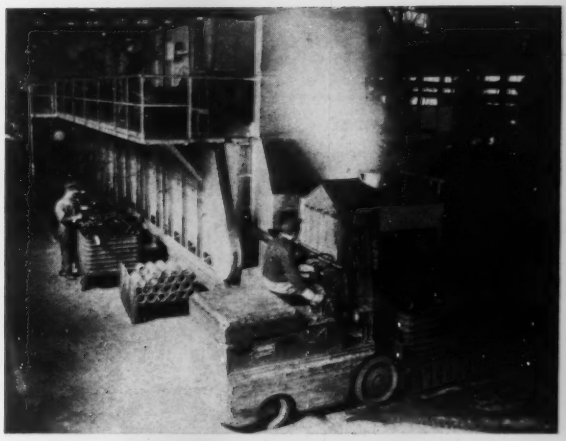


1. Bar ends are heated in a side slot furnace, then tapered in tapering rolls. Conveyors help make the operation continuous. Tapered bars move into a fast heating furnace, designed to heat the bar uniformly to coiling temperature with minimum oxidation

2. Coiling is done manually on special machinery. Springs are coiled to predetermined hot-set height, then pass through a cooling cycle. From the cooling equipment, springs may go directly to a quench, into an equalizing furnace before quench, or into a hardening furnace

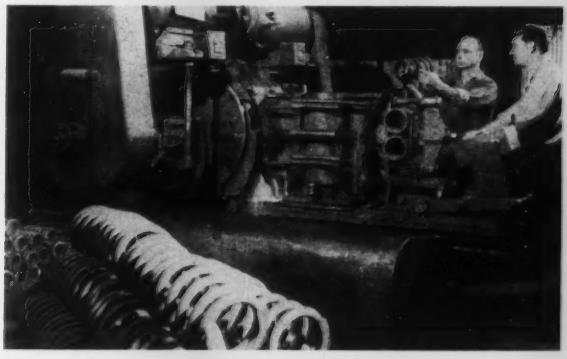


3. This 30-ft, rotary hearth, hardening furnace reheats the springs after cooling to refine grain structure. Furnace atmosphere, time and temperature are closely controlled. Springs emerging from the furnace are oil quenched, then pass through a 50-ft draw furnace

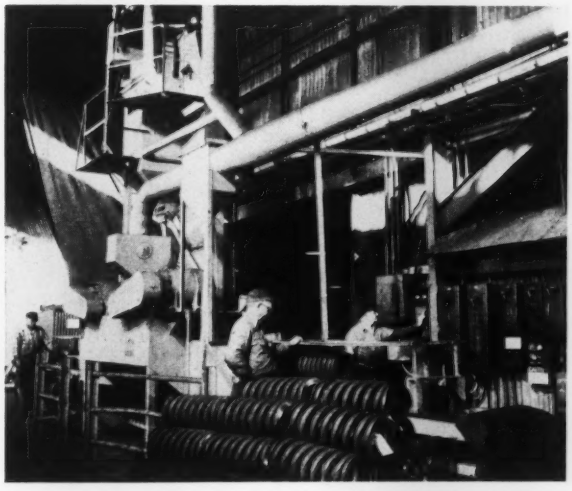


4. The draw furnace is fired by three, direct-type air heaters. Fans recirculate the hot gases over the full furnace length. For precise temperature regulation, the furnace has three zones of temperature control monitored by ten thermocouple check stations

5. All types of springs and heats of steel are given Brinell hardness checks in the as-quenched and as-drawn conditions. Springs are also compression tested after leaving the draw furnace to eliminate initial hot-set height and to check specified permanent free height



6. When perfect seating is required, ends of springs are precision ground on a double end grinder. Two springs can be seen mounted in the grinding fixture. Sometimes inside and outside chamfer grinding are also required



7. A roller-type shot peener is used to produce special spring finishes. Pre-trials are made to determine the density and coverage of peening required for each design. Other finishes are paint, plastic or varnish coatings and rust preventives

8. Final inspection includes Magnaflux and Magnaglo testing. Alco's Chicago Heights plant produces more than 875,000 springs a year. They go into railroad car trucks, locomotives, farm equipment, industrial machinery, crushing equipment and Army tanks

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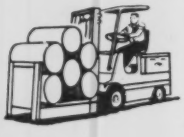

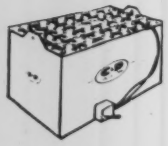

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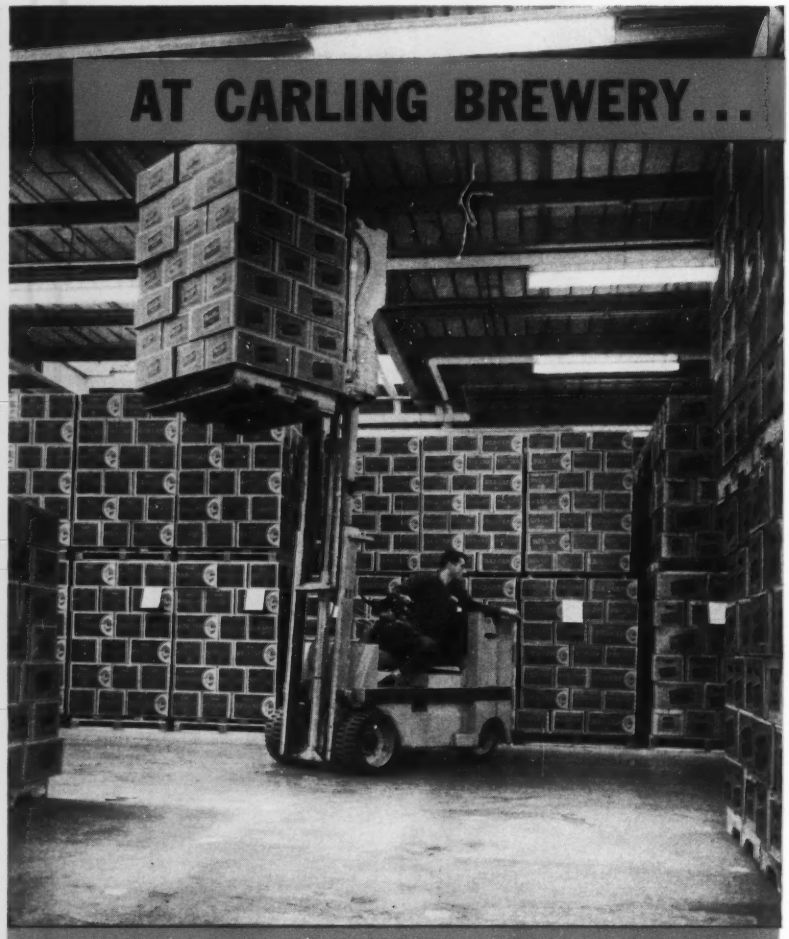

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Trucks all electric . . . batteries by C&D

Efficient, economical *materials handling* is just one more outstanding feature marking the new Natick, Mass., Carling Brewery as one of the most modern of its size in the world.

Modern C & D *Slyver-Clad*® batteries power Carling's fleet of 15 electric trucks as they work this spacious 150,000 square foot warehouse. The trucks lug loads ranging from 600 to 2000 pounds over a 20-mile run. Each truck is equipped with two batteries; one on charge, the other operating. Changing batteries at the end of a shift is a one-man operation.

"We purchased battery-operated fork lifts because they are *clean* and *quiet*," Carling states. And with extra-capacity C & D *Slyver-Clad* batteries aboard, extra power with extra economy is the order of the day . . . every day.

It's easy to see why C&D's a better battery buy!

See how you can get more work—through more battery—from all your electric trucks.

Write for Bulletin IT-524.

C&D

BATTERIES, INC.

of Conshohocken, Pa.

SINCE 1906

Sales and Service Offices in Principal Cities from Coast to Coast

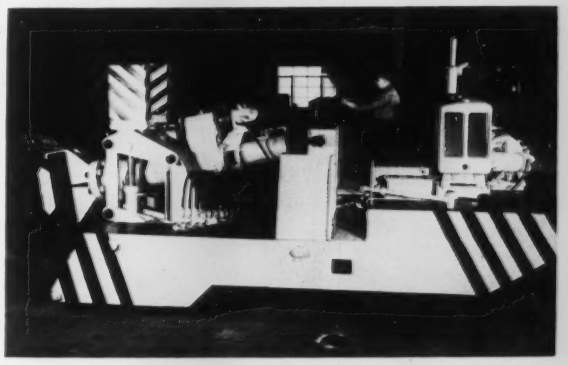
Hydraulic Forging Manipulators Handle 20,000 Lb Parts

This line of Auto-Floor machines has been developed to keep pace with the trend toward increased forging of high alloy steel and refractory alloys.

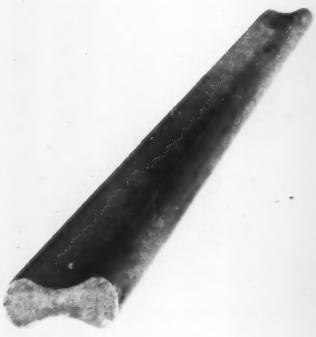
The mobile manipulators are offered in capacities from 2000 to 20,000 lb. They have mechanical and hydraulic shock-absorbing features designed to withstand severe shocks.

Available with diesel, gasoline, propane or plant power sources, the units have unlimited floor travel. Work handling motions are hydraulically controlled.

The manipulators eliminate the need for auxiliary equipment to handle materials between furnaces and presses. *Write*: Salem-Brosius Inc., Box 2222, Pittsburgh 30, Pa. *Phone*: Walnut 2-2200



Aluminum Deoxidizing Bar Increases Ingot Yield



Because of its special shape and method of use, the Ex-Bar dissolves and diffuses in the ingot mold without wasting or burning.

The manufacturer says that operational tests in steel mills have shown good results. Ingot to slab and sheet yields have been increased. Ingot surface is cleaner. Test cut inclusions have been reduced from over 100 to less than 10. The amount of aluminum required has been reduced 33 per cent.

The deoxidizing bars are made in three sizes, in any length. Molds of different capacities can be handled by varying the length of the bar. *Write*: Cleveland Electro Metals Co., 2391 W. 38th St., Cleveland 13, O. *Phone*: Melrose 1-5435

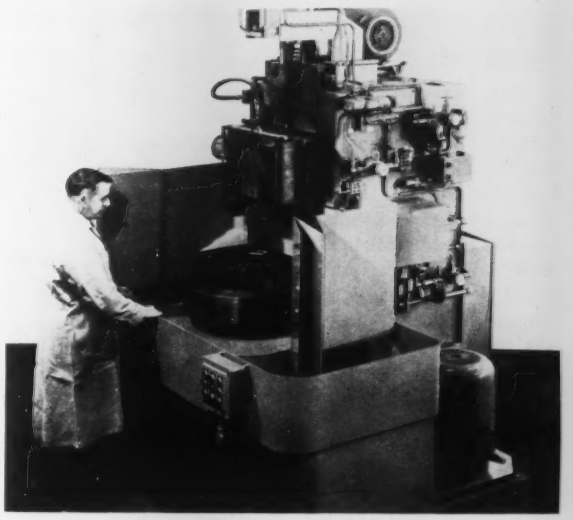
Machines Do Rough and Precision Finishing

This series of single station finishing machines can do contour turning, boring and facing; straight boring; surface grinding; surface honing; inside and outside diameter grinding; contour milling and horizontal or straight milling.

Known as the BL-1 series, the machines use the standard, cam-actuated heads developed for this company's multiple station finishing machines.

The BL-1 machines are available in single or double spindle models with single, multiple or variable speed spindle drives. Motor drives from 3 to 20 hp per spindle are offered. Cross slide travel is 5 in.; longitudinal s'ide travel is 6 in.

Other machine features: Rapid slide traverse during idle time; vertical spindles for easy loading and accurate chucking of parts; open, easily accessible tool area; generous chip space; optional high lift slides for loading of large pieces. *Write*: Hoern & Dilts Division, New Britain Machine Co., Saginaw, Mich. *Phone*: Pleasant 5-3401

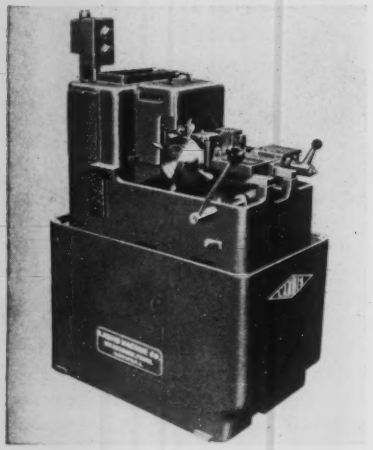


NEW PRODUCTS and equipment

Threading Machine

The 5C Landmaco single spindle machine will produce threads to Class 3 and 4 tolerances at production rates. It has a No. 4 to $\frac{5}{8}$-in. range.

The hardened and ground die head has tangential chasers which can be ground for 80 per cent of their original length. Eight spindle speeds (150 to 1000 rpm) are provided by a geared headstock and V-belt pulley drives.



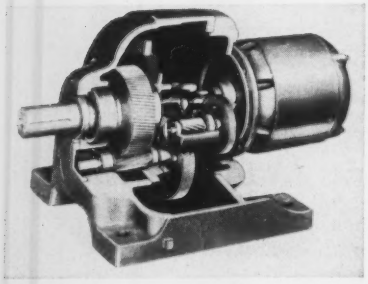
The machine can be furnished with or without lead screw feed. An air operated carriage front, air operated carriage return, automatic or manual work stop and a variety of special carriage fronts for holding hard-to-grip workpieces can be supplied. *Write*: Landis Machine Co., Waynesboro, Pa. *Phone*: Walnut 3-1620

Gearmotors

This line of parallel shaft gearmotors, including both integrally mounted and motor-coupled types, has been expanded.

Units with integrally mounted gear heads and motors provide needed speed without the cost and maintenance of additional transmission equipment. Permanent alignment is built in. Double seals are on honed surfaces of the high speed shafts. Service-proved seals on output shafts provide maximum protection against oil leakage.

Motor-coupled units permit changing motors on the job without draining the oil. Splash



lubrication is provided for all moving gear head parts. Double-shield, permanently lubricated motor bearings are used.

All motors have Glamicone insulation, a combination of glass, mica and silicones. *Write*: Department PI, Electra Motors Inc., 1110 N. Lemon St., Anaheim, Calif. *Phone*: Keystone 5-6061

Transformers

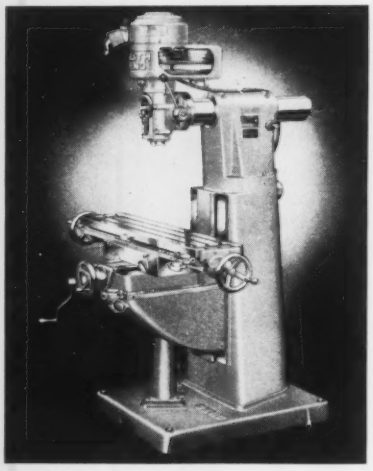
This line of outdoor current and potential transformers provides voltages up to 72,000.

All traces of air are removed from the core and coil assembly by vacuum impregnation. *Write*: Standard Transformer Co., Warren, O. *Phone*: 2156-3

Vertical Milling Machine

Improved design features of this unit contribute to greater ease of operation, increased efficiency and dependable performance.

The head swivels 360 degrees on the flanged end of the overarm for milling, drilling or boring at any angle. A key with tapered gib prevents the overarm from turning in the column bearing. The overarm



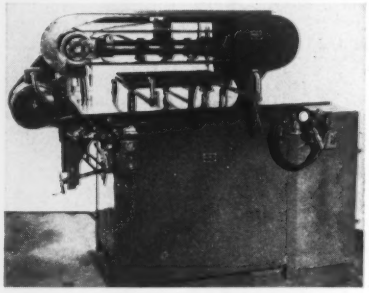
is $4\frac{1}{2}$-in. in diameter, has a 15-in. rack and pinion crossmovement and can be locked rigidly at any point.

The table is 9 in. wide and is available in 32 and 42-in. lengths, providing 20 or 32-in. longitudinal travel. Vertical adjustment is 18 in.

Eight spindle speeds range from 90 to 2500 rpm when using a $\frac{3}{4}$-hp, 1200 rpm motor. With a 1 hp, 1800 rpm motor, speeds vary from 135 to 3750 rpm. *Write*: South Bend Lathe Works, South Bend 22, Ind. *Phone*: Central 2-3311

Sanding Machines

The horizontal model (illustrated) is for use in shell mold stack grinding and many high production, heavy service, flat grinding operations. It has an air controlled automatic tension arm carrying a 6-in. wide belt that is 96 to 106 in. long.



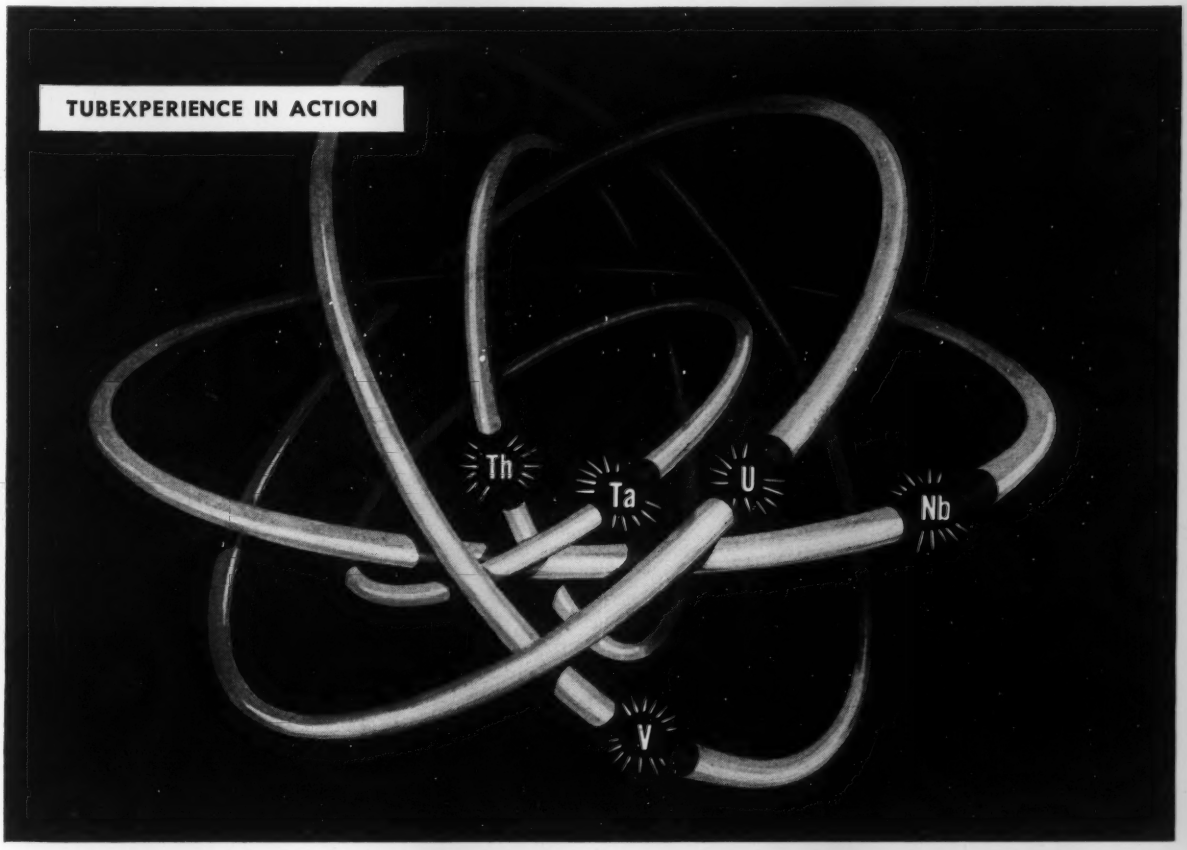
The stock feed platform is air controlled and can be hand or conveyor fed. It is equipped with a 6 in. wide platen and replaceable wear inserts.

Model TTS-2500 Table Tongue Sander: The table tilts 45 degrees to front or rear for predetermined inner or outer diameter angular grinding or deburring. The grinding head has a 6-in. vertical adjustment using a 90-in. abrasive belt, $\frac{1}{4}$ to 2 in. wide. Contact wheels are available. *Write*: Bush Mfg. Co., 909 N. Rochester Rd., Clawson, Mich. *Phone*: Lincoln 5-3737

Ultrasonic Generator

The Vari-Sonic amplifier-generator will produce 1500 watts. It is continuously variable over the frequency range of 3000 to 40,000 cps and is adaptable to many applications.

Because of the design of the out-



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- *Superior has already successfully manufactured tubing from uranium, vanadium, niobium, tantalum and thorium.*
- *Superior has 9 years' experience in drawing tubing from titanium and titanium alloys.*
- *Superior was the first mill to produce tubing from Zirconium, Zircaloy-2, and Zircaloy-3.*

. . . And Superior has produced all this tubing to exceptionally precise specifications and tolerances!

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The end uses for Superior tubing in atomic energy include control rod tubing, fuel element tubing, tubing for moderator and shielding cans, process lines for handling radioactive liquids, and tubing for handling facilities.

NOTE: In some cases, tubing can be produced only with AEC release, because of priorities on materials.

If you are in or serving the atomic industry and need small tubing, this store of experience can be of great assistance to you. For information, write Superior Tube Company, 2005 Germantown Ave., Norristown, Pa.

SEND FOR LATEST DATA ON ZIRCONIUM—*Write for your free copy of Special Analysis Memo 112—on zirconium, covering properties, fabrication and other data.*

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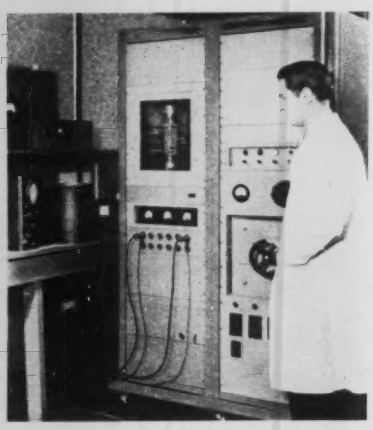
West Coast: Pacific Tube Co., 5710 Smithway St., Los Angeles 22, Calif. • RAymond 3-1331



put stage, good results are possible even though the transducer and the power supply are not matched perfectly. The equipment has been designed to protect itself and the transducer from damage stemming from improper techniques or unexpected overloads.

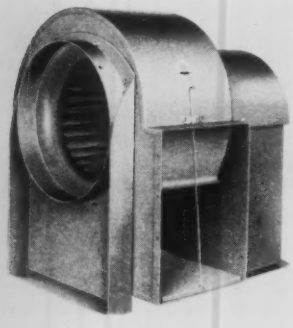
The generator can be operated by nontechnical personnel and will prove useful for product testing, technical investigations, pilot plant use or research. *Write*: Designers for Industry Inc., 4241 Fulton Parkway, Cleveland 9, O. *Phone*: Shadyside 9-0700

Utility Blower Sets

The redesigned line of Sirocco sets features compactness and easy drive accessibility. Applications range from cooling electronic tubes and ventilating small enclosures to supply and exhaust in industrial and commercial buildings.

The redesigned V-belt drive is an overhung design for easy maintenance. All fans have adjustable pitch motor sheaves.

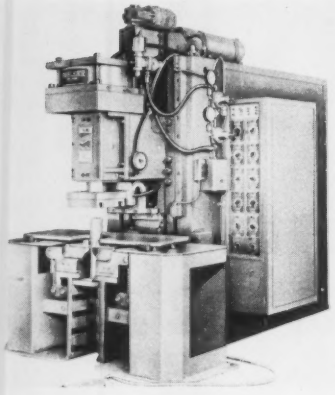
Blowers are available in four direct-drive designs in addition to the overhung V-belt drive units. The redesigned units are available in 14 sizes, with or without weatherproof hood. *Write*: American Blower Division, American-Standard, Detroit 32, Mich. *Phone*: Webster 3-9665



Resistance Welder

The PMCO 6T spot and projection welder is the air operated press type. At 80 psi, the electrode force is 25,325 lb.

It contains a 500 kva, three-phase welding transformer. Maximum secondary current is 125,000 amperes as passed through a mild steel sandwich pile of 1 in. flat, 2 in. round and 1 in. flat. With the three-phase transformer, line currents are relatively low, the the power factor is close to unity and the load is balanced. The slow rising wave front of the fusing current reduces die deterioration.

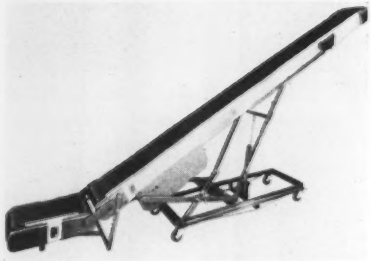


Sturdy construction of the frame and mechanical members minimizes deflection during welding. *Write*: Sciaky Bros. Inc., 4915 W. 67th St., Chicago, Ill. *Phone*: Portsmouth 7-5600

Portable Belt Conveyor

This aluminum conveyor is hydraulically adjustable to facilitate unloading, transferring, boosting and stacking operations.

Raised, the unit provides handy high-low transfer for loading and unloading freight cars, taking bags and boxes away from sealers. Lowered, it acts as a low-cost power component in wheel and roller conveyor lines. In-between positions can be selected for a wide range of handling operations.



Available in 10, 12, 14, 16, 18 and 20 ft lengths, the Trojan Series A conveyor operates in forward and reverse. The nonslip, 12-in. wide belt safely elevates at angles up to 30 degrees without cleats.

Heavy-gage aluminum alloy frame and removable undercarriage fold easily to make the conveyor compact for shipment and storage. *Write*: E. W. Buschman Co., Clifton and Spring Grove avenues, Cincinnati 32, O. *Phone*: Mulberry 1-1600

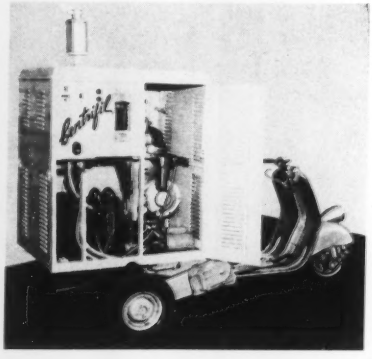
Filter-Centrifuge Unit

In extensive field tests, the Centrifil removed practically 100 per cent of the metallic and nonmetallic contaminants suspended in fresh and used hydraulic oil.

Two standard hose connections tie the filter into the system to be cleaned. Fluid is pumped through a 40-micron filter, then the centrifuge and two 2-micron sintered bronze filters.

Flow capacity is 1 gpm maximum, with a top operating pressure of 100 psi. Under standard conditions, the filters will operate up to 50 hours without cleaning, the centrifuge up to 100 hours.

The filter-centrifuge is available in three models: Model PSC is mounted on a three-wheel power

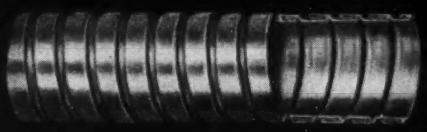


EXTRA HEAVY DUTY

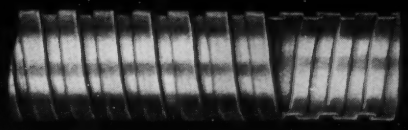
HEAVY DUTY

LIGHT DUTY

MEDIUM DUTY



LIGHTWEIGHT EXHAUST



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FOR EVERY INDUSTRY'S REQUIREMENTS

Tough as a pipe, but flexible, that is Penflex tubing. You name your need for conveying volatiles, liquids, chemicals, powders, granular materials, or semi-solids . . . hot or cold . . . and Penflex has the right tubing to provide the maximum service. It is unsurpassed for withstanding rough abuse, abrasion, crushing and heat.

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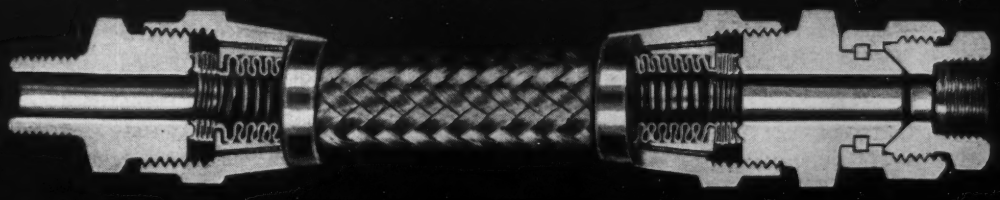
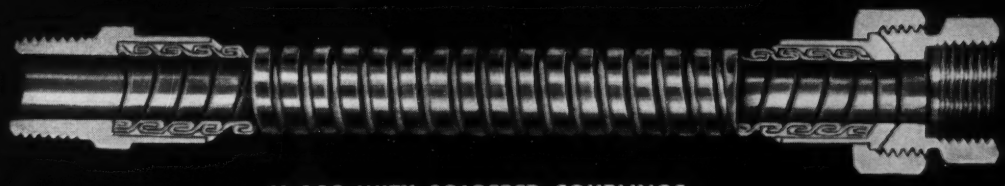


PENFLEXWELD WITH HEATPROOF COUPLINGS



M-100 WITH SOLDERED COUPLINGS

PENFLEX

scooter and is a self-contained unit; model PC is four-wheel mounted with a trailer hitch; model DC is mounted on dolly wheels for plant use. *Write*: Permanent Filter Corp., 1800 W. Washington Blvd., Los Angeles, Calif. *Phone*: Republic 2-8141

Adjustable Shelving

Flexi-Bilt units are for storage areas in which shelving requirements frequently change. They can be readjusted quickly, without tools, bolts or clamps.

On the corner of each shelf is a steel lug. When the shelf is slipped into place, the lugs lock into slots on the uprights and back of the case. A shelf is removed by raising it slightly and pulling it forward.

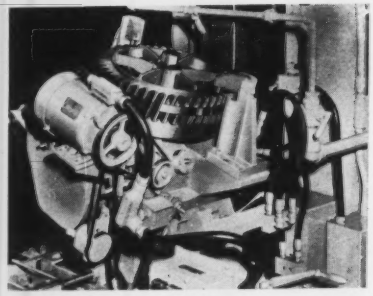
For maximum adjustment, slots for the lugs are spaced 1½-in. apart. Boltless dividers fit into slots spaced 1 in. apart on the shelves to form bins. Fronts and compartmented drawers can be added to the bin units.

Flexi-Bilt cases are heavy gage steel. Shelves have full-length label holders welded to the faces. Cases are 84 x 36½ x 12½-in. *Write*: Berger Division, Republic Steel Corp., Canton 5, O. *Phone*: Glendale 6-2481

Indexing Table

This table provides: Positive index to tenths, no backlash, mechanical self-locking and angular setting (by cradle mounting).

Indexing is controlled by a pin



locked, single revolution index plate. A variable gear train connects the plate to the control worm through a keyed shaft. Rotation occurs only during indexing when the opposed control worm allows the drive worm to move.

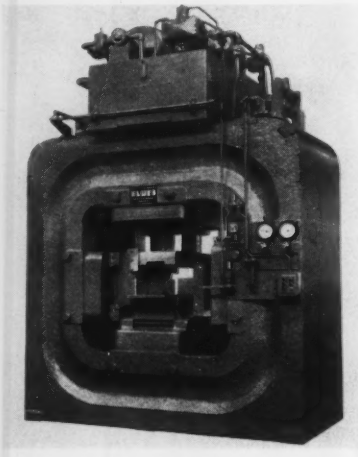
A continuously running motor does double duty: It provides the indexing power and takes up all backlash through two slip-type clutches. All gears lock when the index pin locates into the plate. *Write*: Colonial Broach & Machine Co., P. O. Box 37, Harper Station, Detroit 13, Mich. *Phone*: Jefferson 6-2550

Powdered Metal Press

Capacity of the main ram of this angle-type press is 1000 tons; the side ram's capacity is 750 tons. Deflection is minimized by heavy steel box construction.

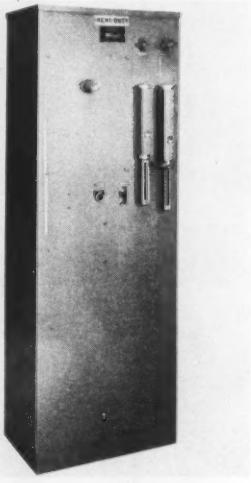
Each ram is controlled by a hand lever. A mechanical interlock prevents the main ram from moving until a predetermined tonnage is reached on the side ram.

Remote control valves vary the tonnage applied to either ram. Rams have rapid approach speeds, slow speeds for pressing and rapid return strokes. *Write*: Elmes Engineering Division, American Steel Foundries, 1150-X Tennessee Ave., Cincinnati 29, O. *Phone*: Redwood 1-9210



Gas Preparation Unit

This automatic gas converter produces a prepared atmosphere through the exothermic reactions of controlled ratios of gas and air. Manufactured, natural or bottled gas may be used; no outside source of air is required.



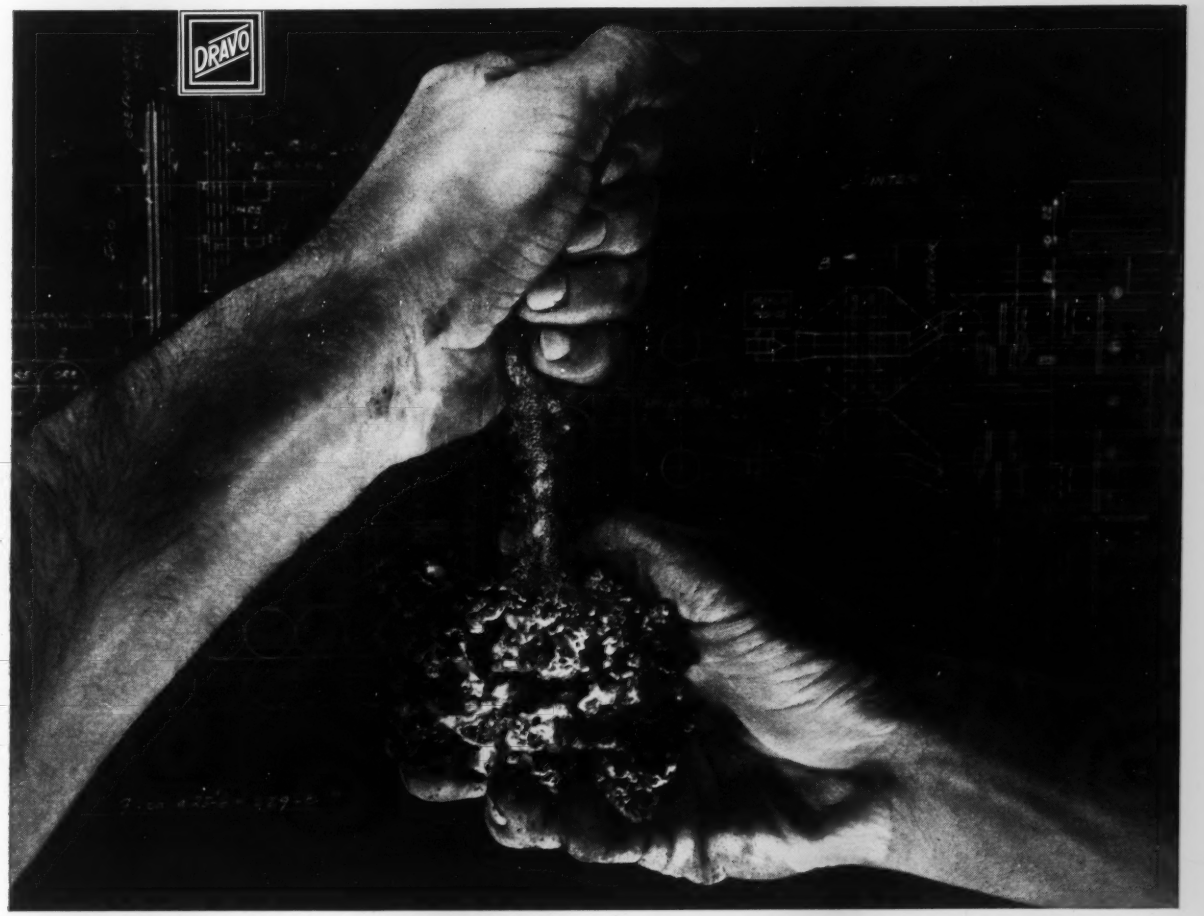
The unit has an automatic ignition that provides simple, quick starting. Gages, flow meters and sampling valve are panel mounted at a height that permits easy inspection and adjustment. Capacity of the generator is 200 cu ft of prepared atmosphere an hour.

Cost of operation depends on the type of primary gas used, and may be as low as 10 cents per 1000 cu ft of gas produced. *Write*: Hevi-Duty Electric Co., Milwaukee 1, Wis. *Phone*: West 3-2756

Tube Forming Machine

The Series 700 unit can be tooled to expand and reduce in diameter, flare and flange the ends of tubing in various sizes and lengths. Production rates go up to 1500 pieces an hour.

Tubes are transferred from a gravity magazine to the work position, clamped, formed and ejected automatically. The machine can be arranged for double operation work through the use of double stroking work slides with the in-



DRAVO-LURGI sinter plants convert iron ore fines to usable form

Two new sinter plants, with a combined annual capacity of over 10,000,000 tons, are being built by Dravo. Each plant will contain three huge sinter machines for processing iron ore fines into clinkers suitable for charging blast furnaces.

Through an exclusive licensing agreement with the Lurgi Company, Europe's foremost builder of sinter machines, Dravo Corporation's extensive engineering and construction facilities are combined with Lurgi's design experience. The new plants now under construction are a result of this combination.

Dravo's engineering and construction skills play an important part in making new processes and techniques available to industry. For information on any of the products or services listed below, write DRAVO CORPORATION, PITTSBURGH 22, PENNSYLVANIA.

DRAVO
CORPORATION

Blast furnace blowers • boiler & power plants • bridge sub-structures • cab conditioners • docks & unloaders • dredging • fabricated piping

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Large NBD cast and machined gear blank

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BUYS PRECISION IN NBD BRONZE

This is a heavy, 34-inch, machined gear blank. But you name your weight! NBD can handle it in gear blanks, bearings and bushings up to 20,000 lbs. Machined to precise tolerances . . . sizes up to 72-inch diameters. Any size, large or small, guaranteed sound!

NBD specializes in bronze metallurgy; has developed more than 40 special alloys. Completely equipped for shell mold, cast-to-size, centrifugal casting.

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AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION

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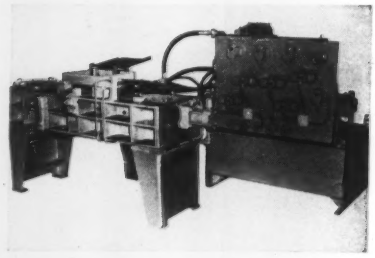
NEW PRODUCTS and equipment



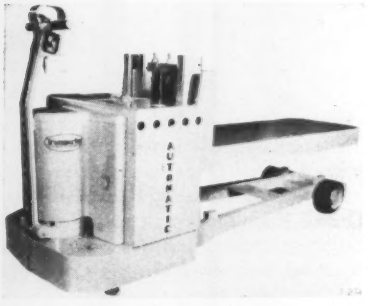
dexing of the forming tools between each stroke.

The unit is completely hydraulic. *Write*: Vaill Engineering Co., 137 E. Main St., Waterbury 20, Conn. *Phone*: Plaza 6-4678

Walkie-Type Lift Trucks

The Hi-Skid Transporter models WWHY-4 and 6 and WWLY-4 and 6 industrial trucks will transport loads carried on skids of varied heights.

Capacities: WWLY and WWHY-4, 4000 lb up to 54 in. of platform length; WWLY and WWHY-6, 6000 lb up to 48 in. of platform length. Other specs: Platform of WWLY models is 6½-in. lowered, lift is 20 in. Platform of WWHY models is 11-in. lowered, lift is 24½-in.



A butterfly-type switch plate, mounted on the steering handle, provides three speeds forward and three in reverse. The drive brake is spring applied, cam released and has external contacting shoes. *Write*: Automatic Transportation Co., 149 W. 87th St., Chicago 20, Ill. *Phone*: Radcliffe 3-7000

Hydraulic Jack

This 100-ton hydraulic jack can be used horizontally or vertically because the oil is sealed in reservoirs. The pump weighs 225 lb,

ONE HOIST GIVES YOU BOTH...

FAST SPEED
For "Open Area" Hoisting

SLOW SPEED
For Accurate Spotting

The Series "700" 'Load Lifter' Electric Hoist is built with a two-speed motor to lift up to 15 tons. There is a *high* speed to handle loads when positioning is not a factor — and *low* speed to spot them with 1/100th-inch accuracy in critical areas. In contrast with variable speed motors, these two speeds are *constant*, whether the hook is empty or carrying a capacity load.

Powerful brakes on the 'Load Lifter' contribute heavily to fine hoisting control. The roller ratchet load brake and multiple disc motor brake stop load travel the instant the control button is released. Both brakes operate simultaneously, yet either alone holds the full load safely.

The Series "700" 'Load Lifter' is simply designed, ruggedly built, and can be serviced easily *in the air*. Available in ½ to 15-ton capacities, with single or two-speed motors, and with all types of suspension. Learn the many other advantages of these heavy-duty hoists. *Ask your "Shaw-Box" Distributor for details or write us for Bulletin 410.*

Hand Geared Trolley. For I-beam tracks or single girder cranes. Easily mounted on the "700" Hoist. Fits wide range of beam sizes. Ball-bearing wheels roll smoothly. Recommended for hoists of 3-tons or more where accurate spotting of loads is essential.

Motor-Driven Trolley. Provides effortless hoist travel at the push of a button. Available for Series "700" 'Load Lifter' Hoists already in service. New hoists can be so equipped before shipment; no additional assembly required.

'Load Lifter' Jib Crane. Self supporting — bolts to the floor. Revolves through a complete circle. Swings easily on ball bearings. No binding. A 'Load Lifter' Hoist on this crane can serve a 550 sq. ft. area. Capacities to 5 tons.

'Budgit' Cord Reel. Keeps conductor cord taut. Cord may be led off in any direction. Useful on any hoist or other motor device up to 7½ HP. and 50 foot cords, depending on available electrical circuits.

57G-3

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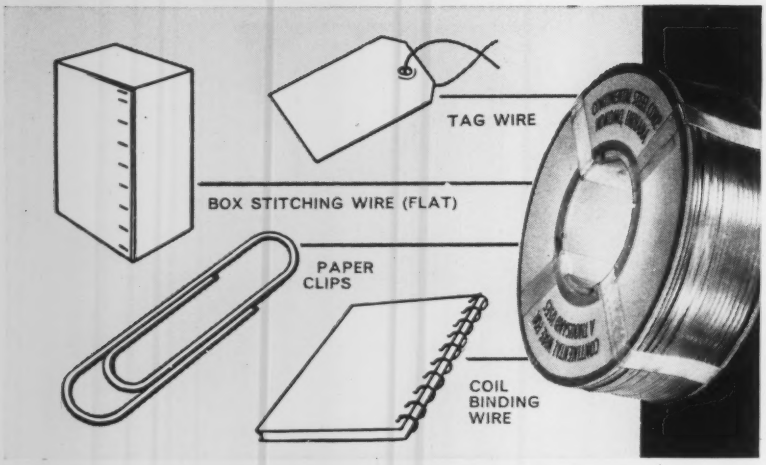
In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.*



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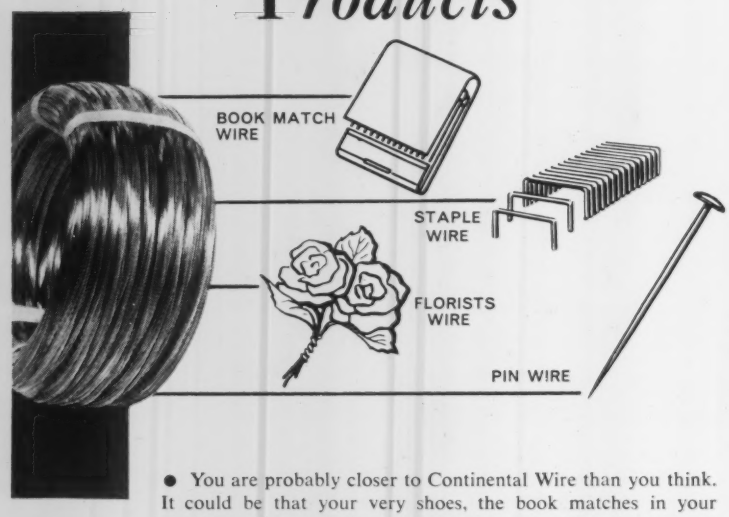

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is 12 in. high and has a power raise of 6⅛-in.

The ram is brought into quick contact with the load by actuating both high speed and high lift plungers. The load can be lifted easily using only the high lift plunger.

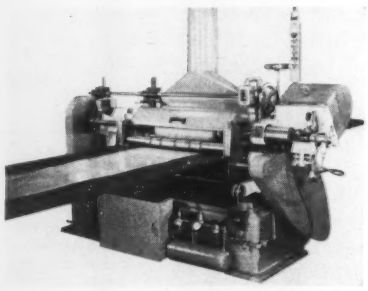
Dual release valves in the base can be operated from either side. The base is tapped and drilled for a pressure gage, which is optional. *Write*: Duff-Norton Co., Pittsburgh, Pa. *Phone*: Poplar 6-8800

Surface Finishing Machine

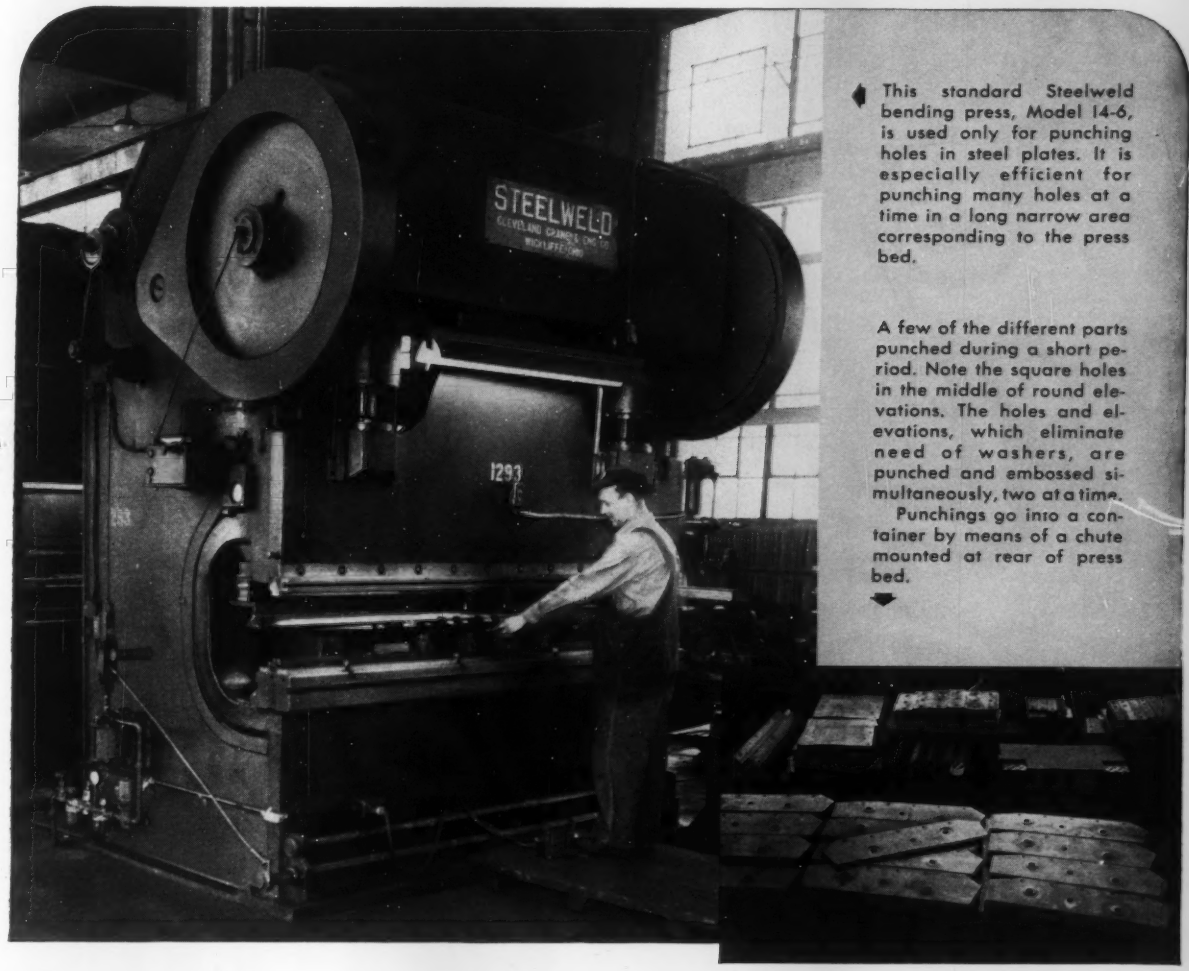
Model 209 has a flexible pinch-roll feed capable of handling sheet or coil stock up to 2 in. thick. The machine can handle printed circuit sheets and unsupported transparent plastic film as well as turn out rough, bright or satin finishes on metals and plastics.

Features: The spindle floats against compressed air and is adjustable for any contact pressure; the spindle or back-up roll can be changed in 2 minutes; coverage of work is complete—there is no salvage.

Where multiple or progressive



Press Brake Used Solely For Multiple Punching



This standard Steelweld bending press, Model 14-6, is used only for punching holes in steel plates. It is especially efficient for punching many holes at a time in a long narrow area corresponding to the press bed.

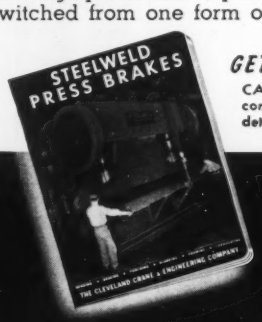
A few of the different parts punched during a short period. Note the square holes in the middle of round elevations. The holes and elevations, which eliminate need of washers, are punched and embossed simultaneously, two at a time.

Punchings go into a container by means of a chute mounted at rear of press bed.

BENDING BRAKES are not always used for bending. Here is one that is used solely for multiple-punching work. It is on its 12th year of continuous operation, punching holes of various sizes and numbers.

While other Steelweld presses in the plant where this machine is located handle many bending and forming operations, any Steelweld can be quickly switched from one form of work to another and thus take care of a wide variety of jobs: bending, forming, multiple-punching, blanking, etc.

Steelweld Bending Presses are versatile, heavily-built tools designed for quick set-up, easy operation and long trouble-free performance. Hundreds of these machines are serving every segment of the metal-working industry. If you need a press brake, you will be happy with a tried and proven Steelweld.



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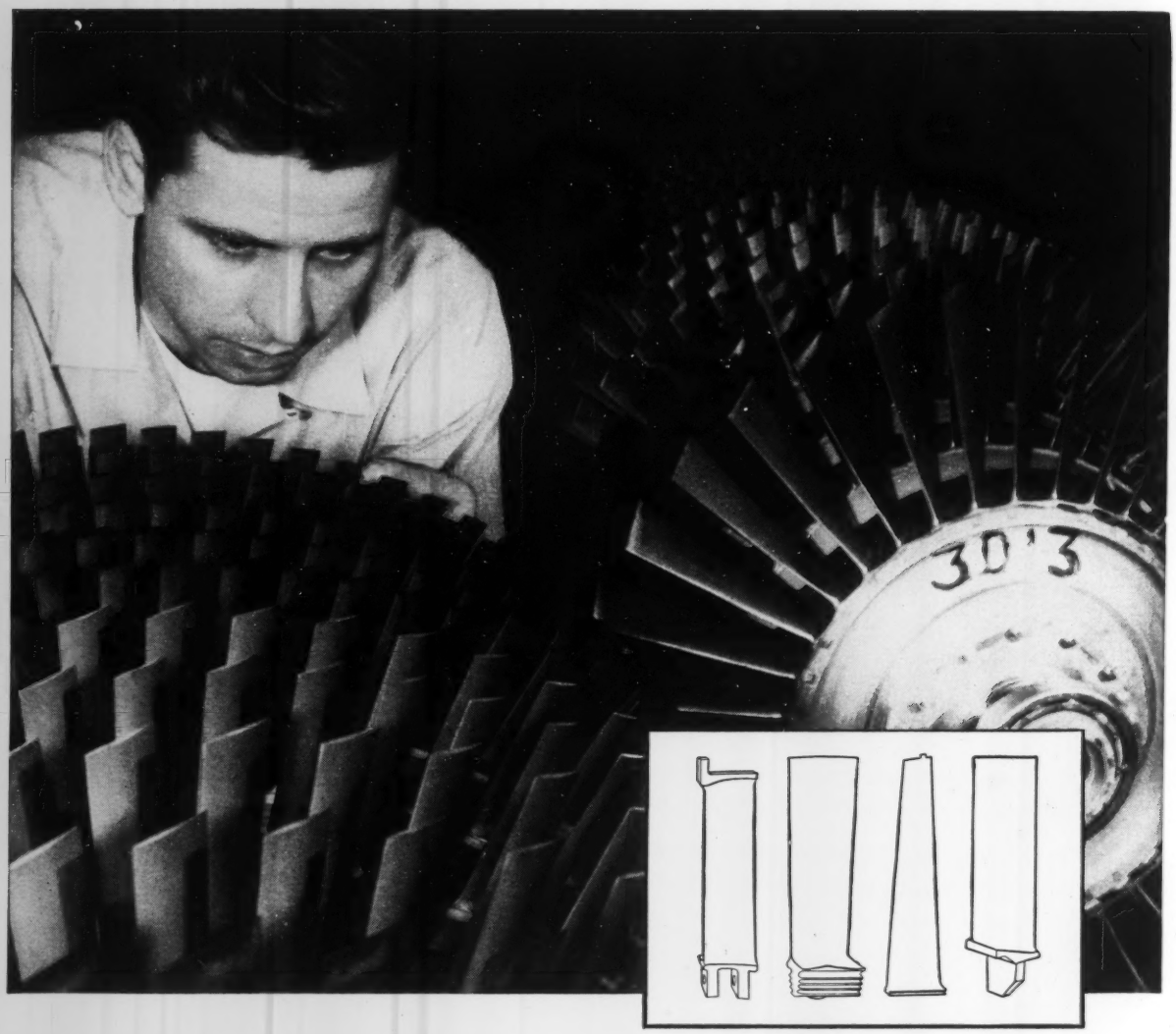

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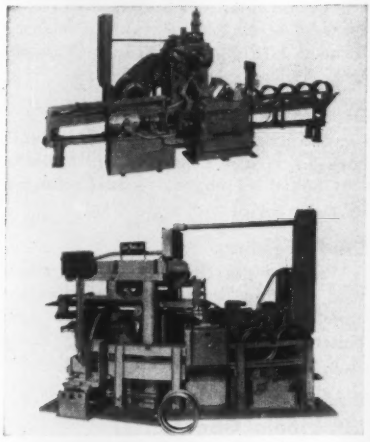
finishing operations are necessary, supplementary stations, integrally controlled by master control, are available. *Write*: Clair Mfg. Co. Inc., Olean, N. Y. *Phone*: Olean 3206

Wheel Rim Line

The Wheel Rim-amatic is a series of three forming machines, with automatic load and unload mechanisms, electrically interlocked to form a continuous line. It produces wheel rims in volume.



Preliminary operations include strip cutoff, hoop forming and welding, trimming and initial forming. In the automatic line, rims are progressively roll formed in the first two machines and sized on the final press.

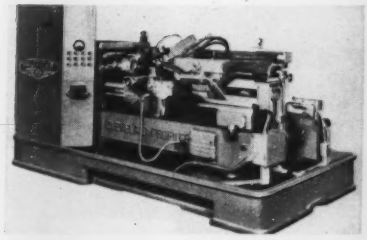
The line is a self-contained unit, completely wired and ready for use. *Write*: LaSalle Tool Inc., 3840 E. Outer Drive, Detroit 34, Mich. *Phone*: Twinbrook 2-1525

Profile Lathe

Heavy construction enables this lathe to use carbide and ceramic tools at spindle speeds up to 5000 rpm. Motors range up to 50 hp. The machine is electronically controlled.

The lathe duplicates from flat or round templates or from a sample part. Sequence control settings are made on a panel of adjustable stops mounted in front.

The hydraulic tracing stylus requires a force of less than ten ounces. The profiling slide (also



hydraulic) cycles automatically. It can take up to four recycle passes at adjustable, preset depths of cut.

Two speed changes and two feed changes can be preselected for operation in any pass, combination of passes or all passes. *Write*: Cleveland Hobbing Machine Co., 1311 Chardon Rd., Cleveland 17, O. *Phone*: Kenmore 1-5240

Polyphase Motor

The Cle-Matic motor has a built-in mechanical brake for quick releasing and fast braking.

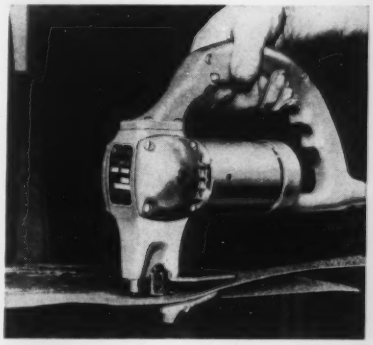
The magnetic field of the stator releases the brake when starting and the permanent magnet applies the braking force when current is turned off.

Braking torques are adjusted easily from the outside with a screw driver. *Write*: Cleveland Electric Motor Co., 5213 Chester Ave., Cleveland 3, O. *Phone*: Utah 1-4211

Shear Cuts Sheet Metal

The No. 16 Shear will cut through cold-rolled steel at speeds up to 30 fpm.

A one-piece shoe is contoured to indicate the correct cutting angle. It is constructed to permit cutting



to a small radius. A deflector plate prevents thin metals from curling. *Write*: Black & Decker Mfg. Co., Towson 4, Md. *Phone*: Valley 3-4400

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for the Steel Industry

OLIVE HILL BF and OLIVE HILL HI-FIRED brick rank high in any list of prominent and widely used brands of blast furnace refractories. Manufactured from dense-burning Kentucky flint fire clays by Grefco's unique manufacturing processes, OLIVE HILL brick set a standard for blast furnace refractory quality and workmanship.

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In service, OLIVE HILL blast furnace brick, both BF and HI-FIRED, have produced many splendid performance records in the past. OLIVE HILL linings in presently operating furnaces, are giving outstanding performance and are more than meeting the increasing requirements of the expanding American Iron and Steel Industry.

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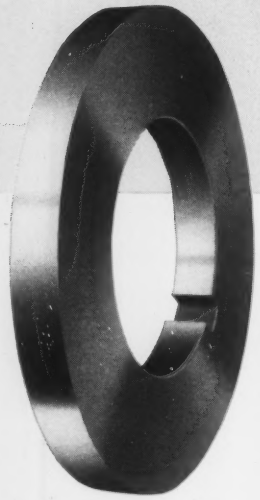
TRIMMING KNIVES



Assure more continuous production and more tonnage from each grind

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No. 102-A Barrow. Single steel wheel with 2" face, 16" diameter and 12 spokes.

No. 113-A Barrow. Two steel wheels with 2" face, 18" diameter and 10 spokes.

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NEW Literature

Write directly to the company for a copy

Aluminum Alloy

Sand or permanent mold castings made with this free-machining aluminum alloy are said to offer corrosion resistance, high strength and high ductility. The material is described in this 4-page bulletin. Apex Smelting Co., 2537 W. Taylor St., Chicago, Ill.

V-Drive Catalog

This 46-page catalog (form F-10) contains information on pulleys, belts, fans and accessories. It's written for production men, design engineers and users of V-drives. Catalog Division, Maurey Mfg. Corp., 2915 S. Wabash Ave., Chicago 16, Ill.

Dielectric Core Oven

Advantages and features of a sand core oven are described in bulletin 15B7306D, 12 pages. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Stud Welding

Ways to get the best results from stud welding and a trouble shooting chart are included in this 34-page bulletin. Nelson Stud Welding Division, Gregory Industries Inc., Lorain, O.

Ultrasonic Gages

Bulletin V-200, 8 pages, describes an ultrasonic resonance instrument used for fast, nondestructive testing. Branson Instruments Inc., 37 Brown House Rd., Stamford, Conn.

Wheel Dressing

Permanent form control of grinding wheels using cutters of cemented diamond particles is discussed in a 6-page bulletin. Koebel Diamond Tool Co., 9456 Grinnell, Detroit 13, Mich.

Pressure Regulators

Catalog 806, 40 pages, describes cylinder, manifold and pipeline regulators for industrial compressed gases. Air Reduction Sales Co., division of Air Reduction Co. Inc., 150 E. 42nd St., New York 17, N. Y.

Positioners

Bulletin HD57, 28 pages, describes gear driven positioners with capacities of 500 to 24,000 lb. Aronson Machine Co., Arcade, N. Y.

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Electrolizing, a proprietary process which deposits a hard, dense nonmag-

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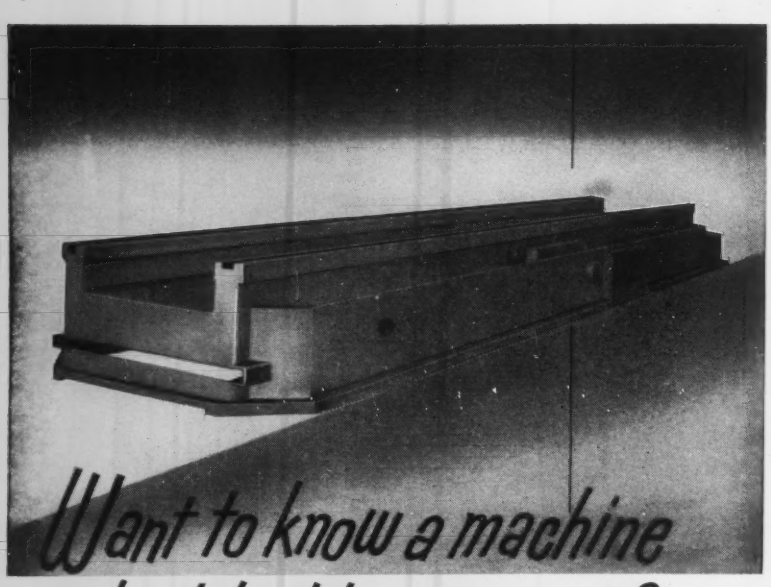

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NEW LITERATURE

netic alloy on metals, is discussed in this 24-page bulletin. Electrolizing Corp., 1505 East End Ave., Chicago Heights, Ill.

Heat Resistant Alloys

This 4-page bulletin lists high alloy steel sheets, plates and bars. Rolled Alloys Inc., 4815 Bellevue Ave., Detroit 7, Mich.

Fire Protection

The economics of fire protection systems is discussed in bulletin 66, 32 pages. Automatic Sprinkler Corp. of America, Youngstown 1, O.

Aluminum Pipe

This 4-page bulletin describes aluminum pipe for tank and vessel hookup. Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky.

Metal Shearing

Knives for metal cutting, their care, handling and recommended cutting practices are described in this 14-page bulletin. Cleveland Knife Division, Hill Acme Co., 1201 W. 65th St., Cleveland 2, O.

Pneumatic Control

Bulletin ND4(9), 12 pages, describes a control system for process units used in steel and other industries. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.

Precision Springs

Factors which influence the cost of coil springs are discussed in bulletin 301C, 12 pages. Engineering Department, Hunter Spring Co., Lansdale, Pa.

Aluminum Dip Brazing

Details on dip brazing with an aluminum-silicon alloy are presented in bulletin 23, 4 pages. Handy & Harman, 82 Fulton St., New York 38, N. Y.

Assembly Machines

This 4-page bulletin describes special automatic machines for assembly operations. Omer E. Robbins Co., 24800 Plymouth Rd., Detroit 39, Mich.

Welding Controls

Hydraulic controls for use with flash buttwelding machines are described in bulletin SP-4A, 12 pages. Taylor-Winfield Corp., Warren, O.

Steel Welding

Production line tests of a semiautomatic process using a continuously fed bare wire, powdered magnetic flux and carbon dioxide gas are de-

scribed in bulletin F-1060, 8 pages. Uses of the process are covered in bulletin F-1076, 4 pages. Weld quality is described in bulletin F-1066, 8 pages. Linde Co., division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

Copper Coated Wire

Specifications of steel wire with copper coatings which are 15, 30 and 40 per cent by weight are given in bulletin 202, 8 pages. National-Standard Co., Niles, Mich.

Cab Conditioners

This 20-page bulletin describes air conditioners for crane cabs and pulpits. Larco Inc., Route 20 East, Painesville, O.

Controllers

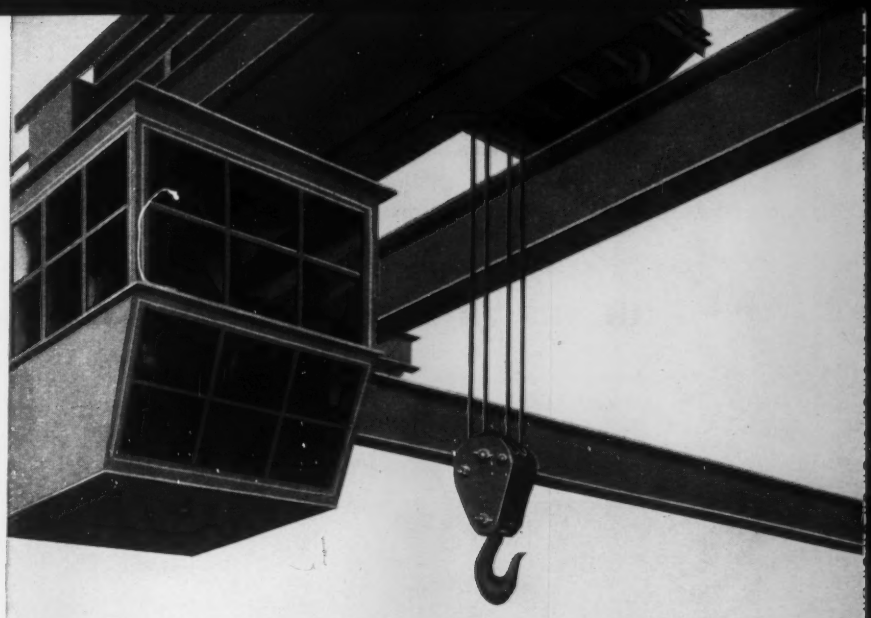
This 18-page bulletin, 5013, describes controllers and control stations. Moore Products Co., H and Lycoming streets, Philadelphia 24, Pa.

NEW BOOKS

Steelplant Refractories, Second Edition, J. H. Chesters, United Steel Companies Ltd., Publications Department, 17 Westbourne Rd., Sheffield 10, England, 728 pages, $12.
This is a completely rewritten version of a comprehensive study first published in 1945. Refractory structure and chemistry, furnace design and miscellaneous uses are covered in detail. While British oriented, the volume gives excellent coverage to American practice. A large appendix containing a glossary, useful tables and refractory testing procedures is included.

Recommended Safety Practices for the Protection of Workers in Foundries, American Foundrymen's Society, Golf and Wolf roads, Des Plaines, Ill. $4.
This manual contains information on the design, construction and use of safeguards and methods of promoting good housekeeping.

Stranggiessen (Continuous Casting), Waldemar Schwarzmaier, Berliner Union GmbH, Stuttgart, Germany, 296 pages, $11.50 (48 Deutschmarks)
The history of continuous casting from the late '20s to the most recent developments is described in detail. Profusely illustrated with drawings and photographs, the volume concludes with an exhaustive list of patents and references.



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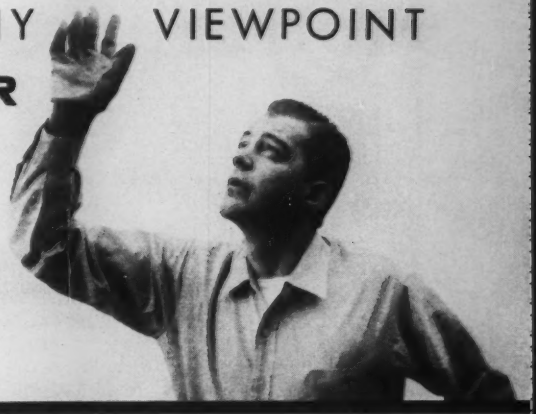

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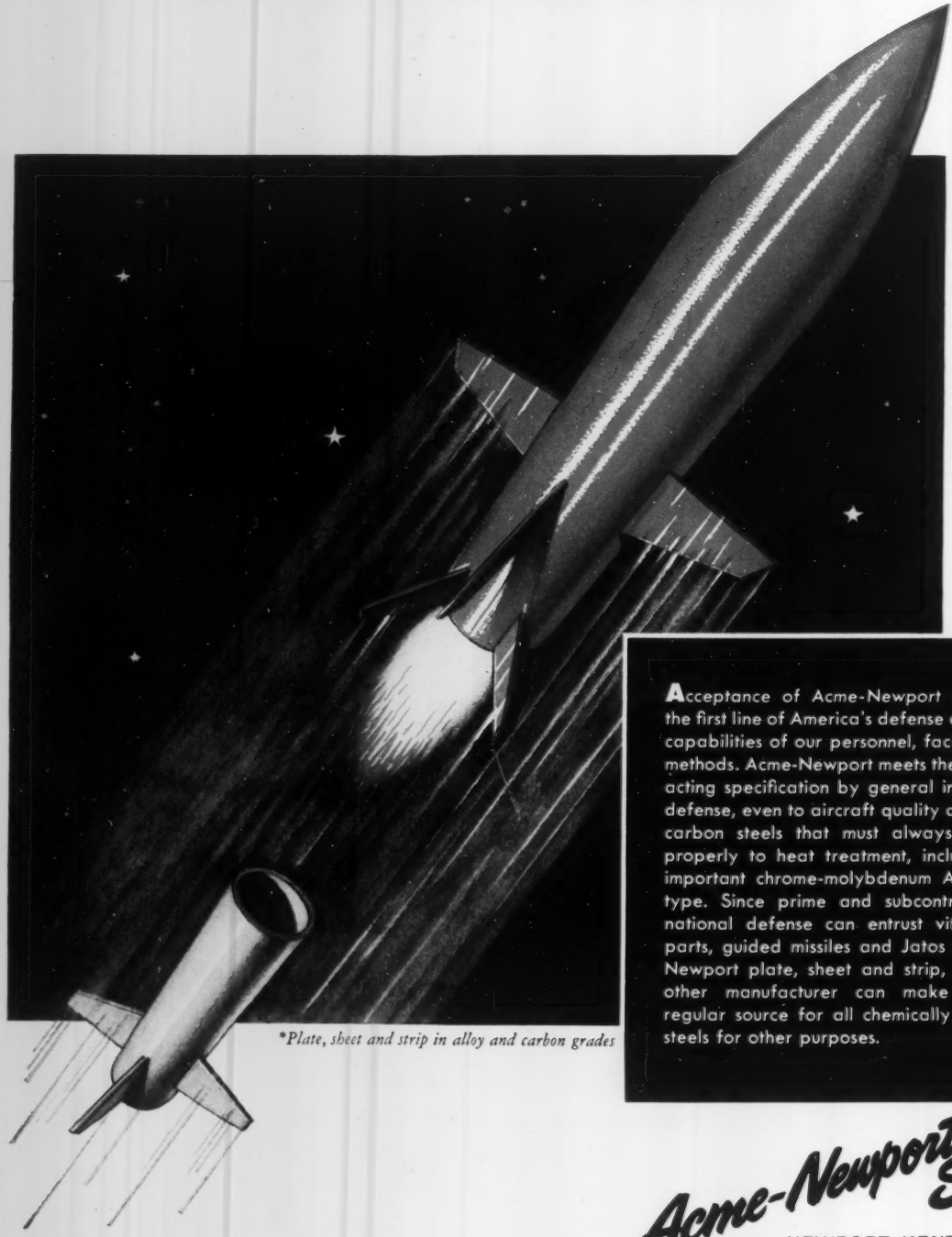


*Plate, sheet and strip in alloy and carbon grades

Acceptance of Acme-Newport steels for the first line of America's defense attests the capabilities of our personnel, facilities and methods. Acme-Newport meets the most exacting specification by general industry or defense, even to aircraft quality alloys and carbon steels that must always respond properly to heat treatment, including the important chrome-molybdenum AISI 4130 type. Since prime and subcontractors in national defense can entrust vital plane parts, guided missiles and Jatos to Acme-Newport plate, sheet and strip, then any other manufacturer can make this his regular source for all chemically accurate steels for other purposes.

Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

A SUBSIDIARY OF ACME STEEL COMPANY

Market Outlook

STEEL PRODUCTION continues to ease off, but there's a mild pickup in demand.

Output of steel for ingots and castings was at 84 per cent of capacity in the week ended May 26. This is 2.5 points below the preceding week's rate and 14.5 points under this year's high—98.5 per cent of mid-January.

BENEFICIARIES—Demand is perking up chiefly for cold-rolled and hot-rolled sheets, hot-rolled bars and merchant pipe.

Producers of these products can still accommodate a substantial volume of orders for June shipment.

CUTTING INVENTORIES—Steel consumption has been exceeding demand. The Federal Reserve Board's industrial production indexes show that users have been living off their inventories. Through April, this year, the board's seasonally adjusted index of primary metal production fell 10 points. Its index of metal fabricating (usage) declined only 3 points. This left the April index of metal fabricating at 177 per cent of the 1947-1949 average.

When inventory reduction runs its course, consumers will have to buy at least as much as they use. Many can't be far from that position now.

GOOD PROSPECTS—Consumption should remain high. Unfilled orders for durable goods, while a little lower than they were at the start of 1957, are 8 per cent higher in dollar volume than they were a year ago. Shipyards have more business booked now than they have had for a long while. Railroad freight cars are being ordered in increasing quantity although production has been high for more than a year. In the first four months of 1957, orders were placed for 23,181 cars, compared with 11,670 in the corresponding period of last year. Car builders already had a substantial backlog of orders.

HEAVYWEIGHTS—Shipbuilding and freight cars take the heavier forms of steel, like structurals and plates. This will help to keep an increased proportion of steel production in the heavier forms (see page 143).

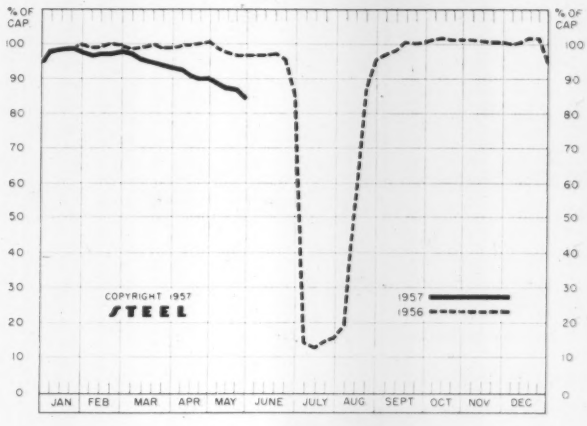
INCENTIVE—An additional incentive to buy steel for June delivery is the prospect of a price increase at midyear when the steelworkers are given an automatic wage boost. One product—tin plate—continues in strong demand even though its price won't be raised at midyear. Tin mill products were increased at the end of April; new prices are guaranteed for six months.

Third quarter demand for oil country tubular goods is high despite weather interference with drilling operations in the Southwest.

SCRAP CLIMBS—The uptrend in scrap prices that began at the end of April continues. (For five months prior to that time, they declined.) A rise of $1.67 in the week ended May 22 put STEEL's price composite for steelmaking scrap up to $46.67 a gross ton. The lowest for this year (week ended Apr. 24) was $42.50.

Much of this increase stems from broker bidding to get scrap to fill orders on hand. Lower production in the metalworking industry, particularly the auto plants, is reducing the generation of production scrap.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended May 26	Change	Same Week 1956	Same Week 1955
Pittsburgh	91	+ 1*	99	99.5
Chicago	85.5	+ 0.5*	101	98.5
Mid-Atlantic	94	— 1	98.5	96.5
Youngstown	81	0	101	95
Wheeling	84.5	— 1	101	93
Cleveland	80	— 3*	99	100.5
Buffalo	52.5	—33	105	104.5
Birmingham	92.5	— 1	23.5	96
New England	56	+ 2	89	85
Cincinnati	80	+ 8.5*	94	89.5
St. Louis	84.5	— 1	99	106
Detroit	80.5	— 2	93.5	94
Western	100	+ 1	107	104
National Rate	84	— 2.5	96.5	97

INGOT PRODUCTION‡

	Week Ended May 26	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	138.2†	134.2	141.2	149.2
NET TONS (In thousands)	2,220†	2,155	2,269	2,396

*Change from preceding week's revised rate.
†Estimated. ‡Amer. Iron & Steel Institute.
Weekly capacity (net tons): 2,559,490 in 1957; 2,461,893 in 1956; 2,413,278 in 1955.

Metalworking Outlook—p. 47 Technical Outlook—p. 93

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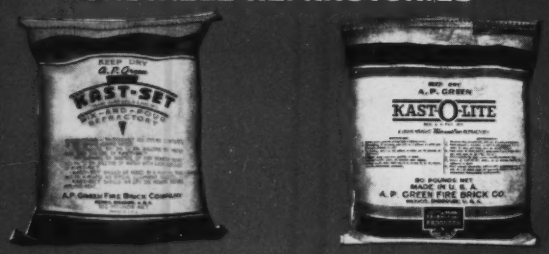

PLANTS:
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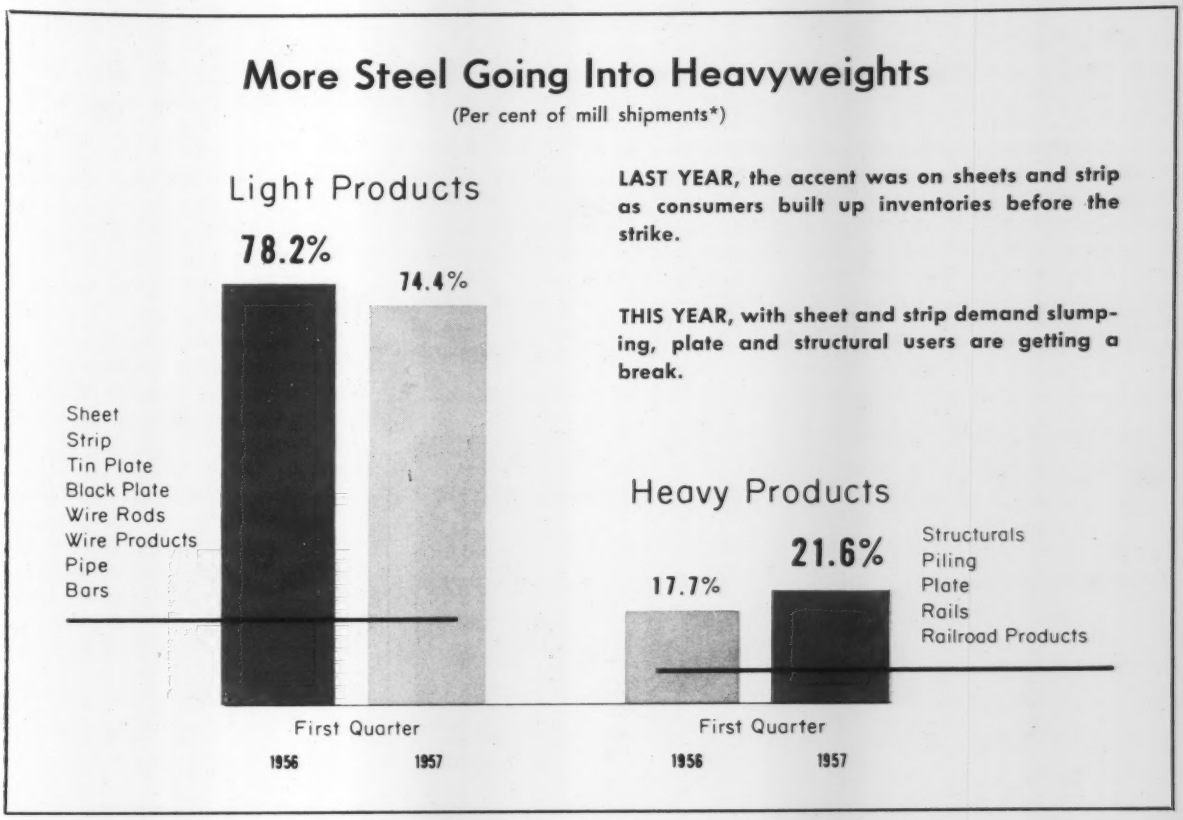
DISTRIBUTORS IN THE PRINCIPAL CITIES OF THE WORLD



*Semifinished products, except wire rods, accounted for 4.1 per cent in first quarter, 1956, and 4 per cent in first quarter, 1957.
Source: American Iron & Steel Institute.

Steel's Product Mix Shifts

As demand for light products has dropped off, mills have boosted output of plates and structurals. Even if the switch is temporary, it has helped heavy industry

BUYERS of structural steel and plates have been hard pressed ever since the end of World War II, but they are finding hope in the recent trend toward the heavyweights in the steelmakers' product mix (see chart above).

The trend not only reflects expanded facilities for such items as wide flanged beams and plates but also the ability of the steel industry to meet changing market conditions better than it has in the past. Two factors primarily account for the shift in product mix: 1. The incessant demand for heavy products from the construction and heavy durable goods industries, resulting in an expansion of capacity in the last three years of 2,063,130 tons for heavy structurals and 581,215 tons for plates (see page 56.) 2. A let-up in demand for light products which permits steel companies to allocate a greater portion of their ingots for heavy products. The slump also has opened up time for the rolling of light plates on strip mills and light shapes on large bar mills.

Another Yardstick—Gains made by heavy products this year are impressive on a tonnage basis, too. During first quarter, the industry produced 1,677,696 tons of heavy structural shapes, compared with 1,369,154 tons in the corresponding 1956 period. Shipments of 614,277 tons in March set a monthly record, reports the American Iron & Steel Institute. For plates, shipments jumped from 1,998,377 tons during the first quarter of 1956 to 2,421,479 tons during the same period this year. March shipments of 881,498 tons set a postwar high.

It's too early to tell whether this shift in product mix is just a flash in the pan or a reaction to the long term trend away from heavy products. The trend has been under way generally since the introduction of mass production in the auto industry. Technological advances in the production of steel and methods of fabrication resulted in a gradual reduction of thickness until today thin sheets can be used where plates used

to be required. In 1930, the steel industry's shipments were split about 62 per cent light to 38 per cent heavy and semifinished, compared with today's 74-26 split. Even more dramatic is the shift in product mix for Bethlehem Steel Co., one of the largest producers of heavy products. In 1930, it shipped only 31 per cent of its output as light products. Upon the completion of its current expansion program, the figure will be 66 per cent.

Boon—Regardless of the duration of the shift, users of heavy products agree it has helped out so far. Fabricators of structural steel were able to ship about 305,000 tons in March, the highest total since May, 1956. With backlogs still rising, they are hoping for continued improvement in supplies. Railroad car builders are shipping cars at the highest monthly rate since 1948. New orders are coming in at a rapid pace (see page 73). Shipyards haven't seen as much activity since war days. Heavy machinery production is still at record levels.

There is only one hitch in the immediate future: If sheet and strip consumers—specifically auto makers—come back into the market strongly this year, the squeeze on heavy products might start all over again.

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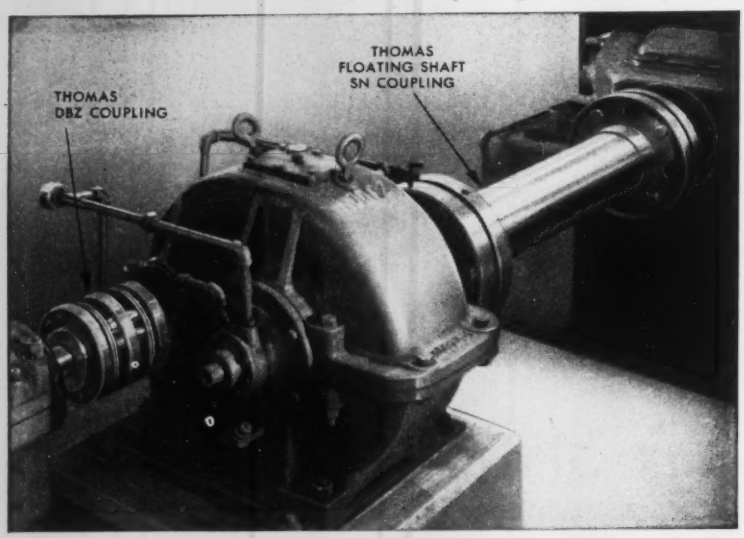

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Tin Plate . . .

Tin Plate Prices, Page 153

A through-barge shipment of tin plate from the Chicago area to Florida was delivered at the River-Gulf terminal in Tampa, Fla., recently. The barge, loaded at Inland Steel Co.'s Indiana Harbor Works, was moved by towboat down the Illinois and Mississippi rivers and across the Gulf of Mexico. The 560-ton shipment, packaged in 3200-lb bundles, went to American Can Co.'s Tampa plant.

Plates . . .

Plate Prices, Page 151

Strip plates and some universal mill plates can still be had for shipment this quarter. But in the heavier and wider sizes, supply continues to be tight. Shipyards and fabricators of line pipe are affected most.

Producers of heavier plate still have openings for the third quarter, but they are not concerned about obtaining all the tonnage they can handle in the period. Some mills haven't opened their books beyond July, except for government rated work.

Supplies are more flexible. By shopping around, New England fabricators are able to place orders for sheared material for delivery close to the month desired. Machine tool requirements and weldments are off slightly in the area, but shipyard and heavy electrical equipment needs are high.

Makers of heavy plates are having less difficulty obtaining semifinished steel. As a result, they expect to improve their deliveries this summer despite vacation interruptions and hot weather.

Light plate demand is beginning to slow down, largely as a result of heavy shipments from the strip mills. Supply of plates under ½-in. is fairly free, so consumers are not faced with the

necessity of ordering far ahead. On the West Coast, supply is definitely better, some sellers offering delivery of certain specifications in six weeks for the first time in many months.

Lukens Steel Co., Coatesville, Pa., is launching an intensive research program to expand its position as a supplier of alloy and alloy-clad steel plates to the petroleum industry.

Steel Bars . . .

Bar Prices, Page 151

Sellers of hot-rolled carbon bars note a slight improvement in demand. Although small, the gain is a change from the gradual shrinking in sales experienced in recent weeks. For the most part, producers think specifications will drop off in July because of seasonal influences—vacations and hot weather—and possibly because of protective covering in June against higher prices at midyear.

Trading in cold-finished bars and in hot and cold-rolled alloys continues dull. Alloy volume is lowest in years. A substantial volume of cold-finished bars is available for prompt shipment from stock.

Structural Shapes . . .

Structural Shape Prices, Page 151

Structural steel shipments to fabricating shops are heavier and are closer to delivery schedules.

Delays are still experienced on wide flange sections. In the East, for example, a tonnage of wide flange beams due for delivery this month will not be received until mid-June.

The mills also are slow to increase allotments to warehouses, most of which are operating with low and unbalanced inventories of shapes.

Demand for heavy plates and shapes will be strong over the next several weeks. Most mills are booked solidly through July. Increased tonnages are being sought for public works, particularly bridges and schools, as the construction season gets into full stride.

Fabricating shops in New England are shying away from premium-priced steel as the supply of structurals, including wide flange sections, improves. Competition for tonnage is sharpening in the area and prices for steel fabricated and in place are leveling off.

Structural requirements for Luken Steel Co.'s expansion are beginning to appear. United Engineers & Constructors Inc., Philadelphia, is inquiring for about 3000 tons for the first new unit, a furnace building, construction of which is scheduled to start in January. The entire program will take 6000 tons.

Tubular Goods . . .

Tubular Goods Prices, Page 155

Producers of oil country tubular goods are finalizing their third quarter plans. By accepting smaller orders than usual, speeding up delivery promises and making other concessions to customers, the mills are getting sufficient business to assure an active quarter.

Orders for drill pipe have improved this month despite some reduction in drilling operations as the

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result of adverse weather.

The outlook for merchant pipe is improving. The construction industry is taking more buttweld. The seasonal pickup in buying in this area has not come up to expectations in the last couple weeks.

The Natural Gas Co. of Omaha, Nebr., has placed a $4 million order for 560 miles of 2, 3 and 4-in. steel pipe with Canadian Western Pipe Mills Ltd., Port Moody, B. C. A total of 6800 tons is involved. First deliveries are to be made in April.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 152 & 153

There appears to be a little more activity in galvanized sheets, but demand for light, flat-rolled steel in general continues to lag. Inventories are being patched in spots, and there is a little more buying in anticipation of higher prices in July.

For the most part, consumers are not committing themselves for additional tonnage unless assured deliveries will be made before June 30. This means some tonnage being placed is July business moved forward. At Chicago, one producer has filled the chinks in his order books with such protective tonnage and can't take additional orders for shipment this quarter.

Tonnage in hot and cold-rolled sheets is still available for delivery this quarter from most mills. Hot sheets are the most active of the major grades. Some of the slight improvement in galvanized demand is attributable to hedging against the expected price rise at midyear.

The auto builders are participating in new buying on a limited scale. Size shortages are responsible, purchases being merely an effort to balance stocks.

Among the flat-rolled specialties, only high silicon sheets show any particular activity. Demand for that grade is strong for heavy electrical equipment.

Steel strapping volume is off.

Warehouse . . .

Warehouse Prices, Page 156

Distributors' inventories are substantial and well balanced with the exception of plates and shapes. Warehouses are showing some inclination to acquire additional tonnages from the mills before June 30.

Improved buying may bring warehouse business this month to almost the April level. Some distributors believe the sales gain will hold through June, particularly in view of prospects for higher prices in July.

The shortening of mill delivery time has held the increase in warehouse sales in check. Mills are able to fill smaller orders for tin plate, bars and light plate which formerly went to warehouses.

Wire . . .

Wire Prices, Pages 153 & 154

Orders for merchant wire have slowed following a slight seasonal flurry in sales. Generally, merchant volume has been disappointing this spring, adverse weather accounting for part of the sluggishness.

Producers of manufacturers wire say little if any sales gain can be expected before late third quarter. June and July will be slow months. Many fabricators close for vaca-

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in 16 models from 20 to 800 amperes

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3 models, 150 to 1875 amperes

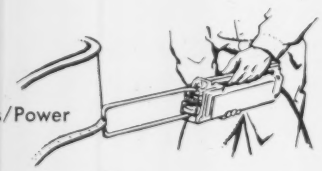
D-C Selenium Rectifier Type
12 models, 3 to 1500 amperes

D-C Selenium Rectifier Constant Potential Type
3 models, 300 to 1000 amperes

A-C/D-C Combinations for Metallic Arc Welding
6 models, 10 to 525 amperes

Spotwelders
14 models, 1.5 to 20 KVA

A-C and D-C Engine Driven Welders/Power Plants
6 models, 15 to 350 amperes



A-C/D-C Combinations for Inert Gas/Metallic Arc Welding
8 models, 10 to 550 amperes

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23 models, 5 to 700 amperes

High Frequency Units
9 models, up to 1000 ampere capacity

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tions in July and August.

Auto builders have accumulated satisfactory inventories preparatory to production curtailments for model changes. As a result, current auto orders are lagging.

Mill backlogs are thin. Price hedge buying for June will lift bookings slightly above May, but the pattern of protective covering against higher prices is irregular, even within the same industries. Prices for wire rope at secondary levels are erratic.

Imports are intensifying competition in the East, particularly in nails and barbed wire. The latter has been coming in at a rate exceeding 60,000 tons annually.

Semifinished Steel . . .

Semifinished Prices, Page 151

A strike in the No. 3 open hearth department of Bethlehem Steel Co.'s Lackawanna (N.Y.) plant resulted in temporary banking of 11 furnaces, pushing the Buffalo ingot rate down to about 53 per cent of capacity.

A San Francisco area steelmaker last week got its open hearth operations back to 113 per cent of rated capacity after having been down around 80 per cent the preceding week.

Bethlehem Pacific Coast Steel Corp. has purchased an 18-acre tract from Dulien Steel Products Inc., Seattle, and will utilize the property in connection with its previously announced Seattle expansion. Foundations are being laid for a new electric furnace.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PENDING

10,695 tons, sheet and bearing piles, including connections, tees, wyes, crosses and corners (640 tons), Corps of Engineers, Pittsburgh.

4900 tons, superstructure-deck, 12-span plate girder bridge, Connecticut river, Windsor Locks-East Windsor, Hartford-Springfield expressway; bids June 3, Hartford, Conn.; also, 600 tons of reinforcing bars.

3300 tons, viaduct, Dover-Union Park street, J. F. Fitzgerald expressway, Boston; M. DeMatteo Construction Co., Quincy, Mass., low on general contract at $6,108,543.

3000 tons, Second Narrows bridge, Vancouver, B.C., to Dominion Bridge Co. Ltd., Vancouver, B.C.

3000 tons, furnace building, Lukens Steel Co., Coatesville, Pa.; United Engineers & Constructors Inc., Philadelphia, engineer in charge; bids asked. An additional 3000 tons will be required for a soaking pit and a 140-in. plate mill.

3830 tons, state bridge, University avenue, Philadelphia, Kaufman Construction Co., Philadelphia, low on general contract.

2660 tons, state bridge work, Mifflin county, Pa., Hempt Bros., Camp Hill, Pa., low on general contract.

1200 tons, trash racks, etc., Rocky Reach power project; bids in May 10 to Chelan county P.U.D., Wenatchee, Wash.

1185 tons, bearing piles, Missouri river, near Mobridge, S. Dak.; bids to Corps of Engineers, Omaha, Nebr.

1000 tons, test facilities, Navy, near Trenton, N.J.; bids asked.

882 tons, state bridge work, Essex county, N.J.; bids June 6; also required are 2106 tons of sheet steel piling and 557 tons of reinforcing steel.

875 tons, Loeb Student Center, New York university, Washington Square area, New York, Lafayette Iron Works, Jersey City, N. J., low on the fabrication contract.

500 tons, state bridge work, Prospect expressway, Kings county, New York, Frank Mascali, Flushing, N.Y., general contractor.

350 tons, state highway bridges, Colchester, Conn.; bids May 27, Hartford, Conn.; also, 285 tons, reinforcing bars.

325 tons, state highway bridges, Greenwich, Conn.; bids May 27, Hartford, Conn.; also, 145 tons, reinforcing bars.

165 tons, rolled beam composite bridge, Derby-Ansonia-Seymour expressway, Connecticut; L. G. DeFelice & Son Inc., North Haven, Conn., low on general contract.

REINFORCING BARS . . .

REINFORCING BARS PLACED

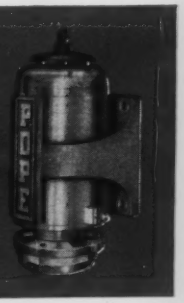
200 tons, naval installation, Adak island, Alaska, to Northwest Steel Rolling Mills Inc., Seattle; Patti-MacDonald Construction Co., and two other firms, joint general contractors.

180 tons, regional high school, Athol, Mass., to Northeastern Steel Products, Boston; Daniel O'Connell's Sons Inc., Holyoke, Mass., general contractor.

REINFORCING BARS PENDING

6220 tons, highway structures, Kane, Cook and DuPage counties; bids May 29, Illinois State Toll Highway Commission, Chicago; also

How to lower your production cost with the right Spindle for your job and the right Spindle Service



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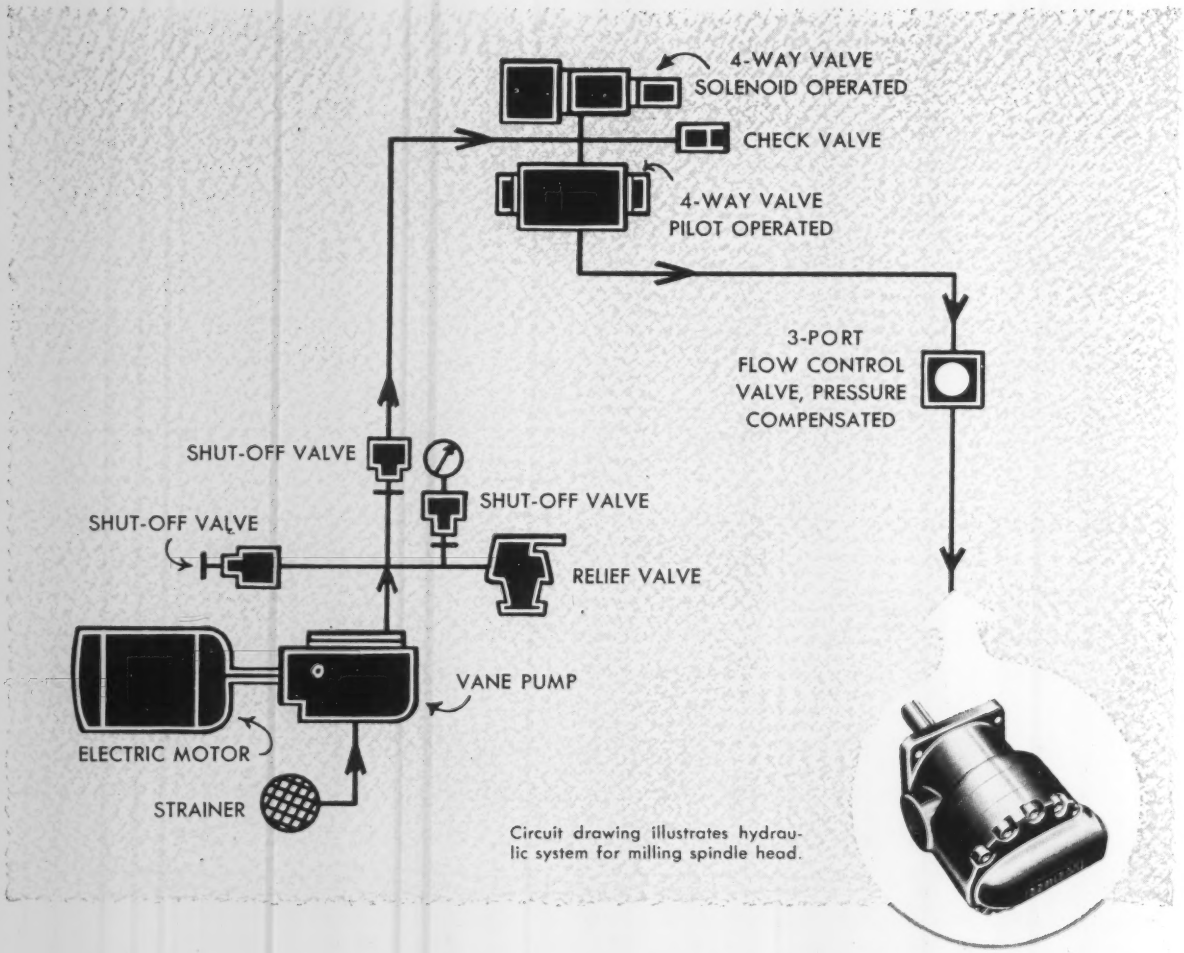
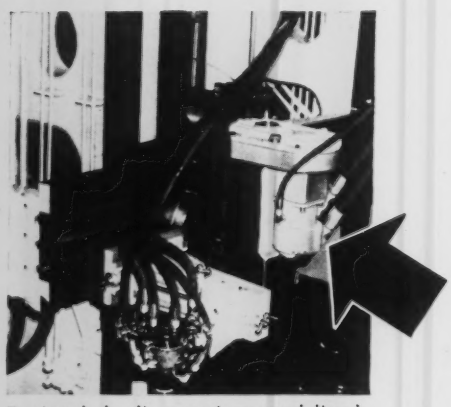


Circuit drawing illustrates hydraulic system for milling spindle head.

Developing a compact, efficient spindle head

...another application for Denison hydraulic power



Denison hydraulic motor is mounted directly to gear case of spindle and powers driver gear of the gear train.

THE PROBLEM: to develop a compact, efficient milling spindle head with infinitely variable spindle speed and instantaneous speed selection.

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1175 tons, state bridge work, Philadelphia, Kaufman Construction Co., Philadelphia, low on general contract.

1055 tons, state highway structures, Division street bridge project, Pawtucket, R.I.; contract 3.

559 tons, state bridge work, Essex county, N.J.; bids June 6; also required are 2107 tons of sheet steel piling and 882 tons of structural steel.

499 tons, state bridge work, Camden county, N.J.; bids closed May 21.

320 tons, state highway bridges, Concord-Hopkinton, N.H.

255 ton, three bridges, first unit of Tacoma-Everett freeway; bids to State Highway Department, Olympia, Wash., May 21.

PLATES . . .

PLATES PLACED

5400 tons, Greater Vancouver Water District, 48 to 72-in. diameter, ⅜ to ½-in. thickness, to Dominion Bridge Co. Ltd., Vancouver, B.C.

6000 tons, penstocks, liners, etc., British Columbia Electric Co.'s Bridge river project, to Dominion Bridge Co. Ltd., Vancouver, B.C.

1700 tons, B.C. Forest Products pulp mill, Crofton, Vancouver Island, to Dominion Bridge Co. Ltd., Vancouver, B.C.

720 tons, seven sulphate digesters, B.C. Forest Products pulp mill, Crofton, Vancouver Island, to Dominion Bridge Co. Ltd., Vancouver, B.C.

PLATES PENDING

1625 tons, penstock and other items, Green Springs power plant; bids to Bureau of Reclamation, Camp White, Oreg., June 18.

350 tons, 1-million-gal steel storage tank, Oklahoma Ordnance Works; bids about June 20, Corps of Engineers, Tulsa, Okla.

300 tons, two 400,000-gal water tanks, Cape Lisburne AFS, Alaska; bids June 6, Anchorage, Alaska.

125 tons, 10,000-bbl fuel storage tank, Columbus AFB, Mississippi; bids to the Corps of Engineers, Mobile, Ala.

PIPE . . .

CAST IRON PIPE PLACED

700 tons, 16 and 12-in., for Mukilteo, Wash., to Pacific States Cast Iron Pipe Co., Seattle.

STEEL PIPE PLACED

300 tons, 2 to 4-in. steel oil line pipe, for Alaska-Yukon Co., to Canadian Western Pipe Mills Ltd., Port Moody, B.C.

68 tons, 560 miles of 2 to 4-in. natural gas line for Natural Gas Co., Omaha, Nebr., to Canadian Western Pipe Mills Ltd., Port Moody, B.C.

RAILS, CARS . . .

LOCOMOTIVES PLACED

Pennsylvania, fifty 1750-hp all-purpose diesel freight units, to the Electro-Motive Division, General Motors Corp., La Grange, Ill.

Argentine State Railways, twenty 1320-hp diesel-electric locomotives, to General Electric Co., Schenectady, N.Y.

U.S. Steel Corp., Pittsburgh, eight industrial locomotives to General Electric Co., Erie, Pa. Four 80-ton diesel-electric units will be placed in service at U.S. Steel's Gary, Ind., plant; three 85-ton units at the South Works, and one 80-ton unit at the Duquesne Works.

Argentine State Railways, twenty 1320-hp diesel units to General Electric Co., Schenectady, N. Y.

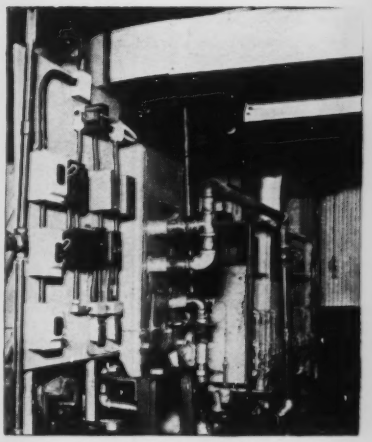
National of Colombia, eighteen 1320-hp diesel engines, to General Electric Co., Schenectady, N. Y.

RAILROAD CARS PLACED

Great Northern, 1000 steel boxcars and 50 fifty-ton flatcars; to own shops.

RAILROAD CARS PENDING

South African Railways and Harbors Administration, Johannesburg, 1007 passenger cars; bids to be asked shortly.



Improve Quenching and You Get Better Heat Treating

● The NIAGARA *Aero* HEAT EXCHANGER transfers the heat from the quench bath to atmospheric air. It never fails to remove the heat at the rate of input, giving you real control of the quench bath temperature. This prevents flashing of oil quenches. In all cases it improves physical properties, saves loss of your product from rejections and gives you faster production, increasing your heat treating capacity. You can put heat back into the quench bath to save the losses of a "warm-up" period.

Savings in piping, pumping and power as well as great savings in cooling water return the cost of the equipment to you in a short time. The Niagara *Aero* Heat Exchanger saves nearly all of the water consumed by conventional cooling methods.

For the complete story of other benefits and savings, write for Bulletins 120 and 132.

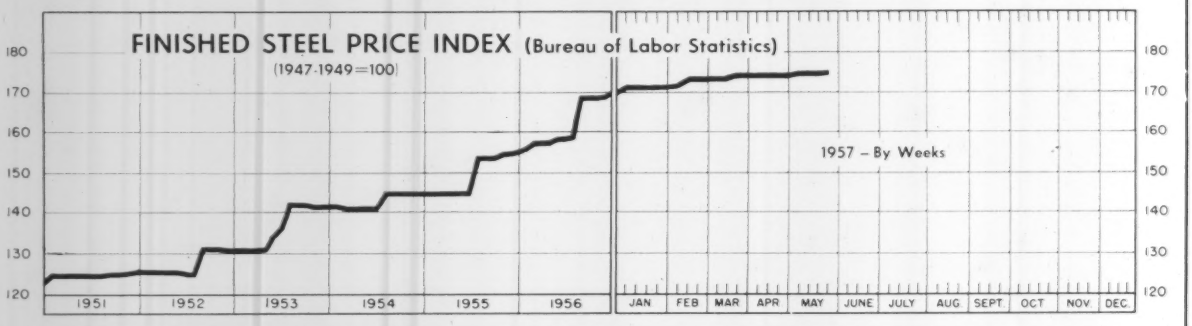
NIAGARA BLOWER COMPANY

Dept. S-5, 405 Lexington Ave.

NEW YORK 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

Price Indexes and Composites



May 21, 1957	Week Ago	Month Ago	May Avg.	Year Ago
174.4	174.4	174.0	174.4	158.1

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended May 21

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard, No. 1	$5.350	Bars, Reinforcing	5.788
Rails, Light, 40 lb	6.817	Bars, C.F., Carbon	9.910
Tie Plates	6.275	Bars, C.F., Alloy	13.425
Axles, Railway	9.400	Bars, C.F., Stainless, 302 (lb)	0.533
Wheels, Freight Car, 33 in. (per wheel)	57.50	Sheets, H.R., Carbon	5.945
Plates, Carbon	5.900	Sheets, C.R., Carbon	6.789
Structural Shapes	5.667	Sheets, Galvanized	8.070
Bars, Tool Steel, Carbon (lb)	0.480	Sheets, C.R., Stainless, 302 (lb)	0.660
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.585	Sheets, Electrical	11.225
Bars, Tool Steel, H.R., Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.274	Strip, C.R., Carbon	8.843
Bars, Tool Steel, H.R., Alloy, High Speed, W18, Cr 4, V 1 (lb)	1.769	Strip, C.R., Stainless, 430 (lb)	0.475
Bars, H.R., Alloy	10.150	Strip, H.R., Carbon	6.000
Bars, H.R., Stainless, 303 (lb)	0.508	Pipe, Black, Buttweld (100 ft)	18.894
Bars, H.R., Carbon	6.075	Pipe, Galv., Buttweld (100 ft)	22.688
		Pipe, Line (100 ft)	190.108
		Casing, Oil Well, Carbon (100 ft)	185.566
		Casing, Oil Well, Alloy (100 ft)	288.980
Tubes, Boiler (100 ft)	46.737	Black Plate, Canmaking Quality (95 lb base box)	7.583
Tubing, Mechanical, Carbon (100 ft)	23.713	Wire, Drawn, Carbon	9.775
Tubing, Mechanical, Stainless, 304 (100 ft)	197.663	Wire, Drawn, Stainless, 430 (lb)	0.636
Tin Plate, Hot-dipped, 1.25 lb (95 lb base box)	9.783	Bale Ties (bundle)	7.423
Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.483	Nails, Wire, 8d Common	9.365
		Wire, Barbed (80-rod spool)	8.347
		Woven Wire Fence (20-rod roll)	20.587

STEEL's FINISHED STEEL PRICE INDEX*

	May 22 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	228.59	228.59	227.41	210.45	171.92
Index in cents per lb	6.193	6.193	6.161	5.701	4.657

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT	$140.24	$140.24	$139.71	$128.98	$106.32
No. 2 Fdry Pig Iron, GT	64.70	64.70	64.70	60.27	52.54
Basic Pig Iron, GT	64.23	64.23	64.23	59.80	52.16
Malleable Pig Iron, GT	65.77	65.77	65.77	61.27	53.27
Steelmaking Scrap, GT	46.67	45.00	42.50	50.17	43.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	May 22 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.075	5.075	5.075	4.65	3.70
Bars, H.R., Chicago	5.075	5.075	5.075	4.65	3.70
Bars, H.R., deld., Philadelphia	5.365	5.365	5.365	4.93	4.252
Bars, C.F., Pittsburgh	6.85*	6.85*	6.85*	6.25*	4.55
Shapes, Std., Pittsburgh	5.00	5.00	5.00	4.60	3.65
Shapes, Std., Chicago	5.00	5.00	5.00	4.60	3.65
Shapes, deld., Philadelphia	5.31	5.31	5.31	5.00	3.93
Plates, Pittsburgh	4.85	4.85	4.85	4.50	3.70
Plates, Chicago	4.85	4.85	4.85	4.50	3.70
Plates, Coatesville, Pa.	5.25	5.25	5.25	4.80	4.15
Plates, Sparrows Point, Md.	4.85	4.85	4.85	4.50	3.70
Plates, Claymont, Del.	5.70	5.70	5.70	5.35	4.15
Sheets, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.60-3.75
Sheets, H.R., Chicago	4.675	4.675	4.675	4.325	3.60
Sheets, C.R., Pittsburgh	5.75	5.75	5.75	5.325	4.35
Sheets, C.R., Chicago	5.75	5.75	5.75	5.325	4.35
Sheets, C.R., Detroit	5.75-5.85	5.75-5.85	5.75-5.85	5.325-5.425	4.55
Sheets, Galv., Pittsburgh	6.30	6.30	6.30	5.85	4.80
Strip, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.75-4.00
Strip, H.R., Chicago	4.675	4.675	4.675	4.325	3.50
Strip, C.R., Pittsburgh	6.85	6.85	6.85	6.25	4.65-5.35
Strip, C.R., Chicago	6.85	6.85	6.85	6.25-6.35	4.90
Strip, C.R., Detroit	6.95	6.95	6.95	6.35	4.85-5.60
Wire, Basic, Pittsburgh	7.20	7.20	7.20	6.60	4.85-5.10
Nails, Wire, Pittsburgh	8.49	8.49	8.49	7.60	5.90-6.20
Tin plate (1.50 lb) box, Pitts.	$10.30	$10.30	$9.95	$9.85	$8.70

*Including 0.35c for special quality.

SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$91.50	$91.50	$91.50	$84.50	$66.00
Wire rods, 7/32-5/8" Pitts.	5.80	5.80	5.80	5.375	4.10-4.30

PIG IRON, Gross Ton	May 22 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pitts.	$65.50	$65.50	$65.50	$61.00	$53.00
Basic, Valley	64.50	64.50	64.50	60.00	52.00
Basic, deld., Phila.	68.38	68.38	68.38	63.76	56.75
No. 2 Fdry, NevilleIsland, Pa.	65.00	65.00	65.00	60.50	52.50
No. 2 Fdry, Chicago	65.00	65.00	65.00	60.50	52.50
No. 2 Fdry, deld., Phila.	68.88	68.88	68.88	64.26	57.25
No. 2 Fdry, Birm.	59.00	59.00	59.00	55.00	48.88
No. 2 Fdry (Birm.) deld. Cin.	66.70	66.70	66.70	62.70	55.49
Malleable, Valley	65.00	65.00	65.00	60.50	52.50
Malleable, Chicago	65.00	65.00	65.00	60.50	52.50
Ferromanganese, Duquesne	255.00†	255.00†	255.00†	215.00†	188.00*

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$45.50	$44.50	$41.50	$48.50	$44.00
No. 1 Heavy Melt, E. Pa.	52.00	50.00	46.00	51.50	42.50
No. 1 Heavy Melt, Chicago	42.50	40.50	40.00	50.50	42.50
No. 1 Heavy Melt, Valley	43.50	43.50	41.50	53.50	44.00
No. 1 Heavy Melt, Cleve.	38.50	38.50	38.50	49.50	43.00
No. 1 Heavy Melt, Buffalo	40.50	40.50	41.50	51.50	43.00
Rails, Rerolling, Chicago	61.50	56.50	56.50	71.50	52.50
No. 1 Cast, Chicago	42.50	40.50	39.50	47.50	49.00

COKE, Net Ton					
Beehive, Furn., Connlsvl.	$15.25	$15.25	$15.25	$14.125	$14.75
Beehive, Fdry., Connlsvl.	18.00	18.00	18.00	16.50	17.50

Steel Prices

Mill prices as reported to STEEL, May 22, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers, page 152; to footnotes, page 154.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5 .....$70.50

INGOTS, Alloy (NT)

Detroit S41 .....$74.00
Houston S5 .....74.00
Midland,Pa. C18 .....74.00
Munhall,Pa. U5 .....74.00

BILLETS, BLOOMS & SLABS

Carbon, Rerolling (NT)

Bessemer,Pa. U5 ....$74.00
Bridgeport,Conn. N19 ..79.00
Buffalo R2 .....74.00
Clairton,Pa. U5 .....74.00
Ensley,Ala. T2 .....74.00
Fairfield,Ala. T2 .....74.00
Fontana,Calif. K1 ....83.50
Gary,Ind. U5 .....74.00
Johnstown,Pa. B2 .....74.00
Lackawanna,N.Y. B2 ..74.00
LoneStar,Tex. L6 .....80.00
Munhall,Pa. U5 .....74.00
S.Chicago,Ill. R2, U5 ..74.00
S.Duquesne,Pa. U5 ...74.00
Sterling,Ill. N15 .....74.00
Youngstown R2 .....74.00

Carbon, Forging (NT)

Bessemer,Pa. U5 ....$91.50
Bridgeport,Conn. N19 ..96.50
Buffalo R2 .....91.50
Canton,O. R2 .....94.00
Clairton,Pa. U5 .....91.50
Conshohocken,Pa. A3 ..96.50
Ensley,Ala. T2 .....91.50
Fairfield,Ala. T2 .....91.50
Fontana,Calif. K1 ....101.00
Gary,Ind. U5 .....91.50
Geneva,Utah C11 ....91.50
Houston S5 .....96.50
Johnstown,Pa. B2 ....91.50
Lackawanna,N.Y. B2..91.50
LosAngeles B3 .....101.00
Midland,Pa. C18 .....91.50
Munhall,Pa. U5 .....91.50
Seattle B3 .....105.00
S.Chicago R2, U5, W14 91.50
S.Duquesne,Pa. U5 ...91.50
S.SanFrancisco B3 ...101.00

Alloy, Forging (NT)

Bethlehem,Pa. B2 ...$107.00
Bridgeport, Conn. N19.107.00
Buffalo R2 .....107.00
Canton,O. R2 .....107.00
Conshohocken,Pa. A3 .114.00
Detroit S41 .....107.00
Fontana,Calif. K1 ....128.00
Gary,Ind. U5 .....107.00
Houston S5 .....112.00
Ind.Harbor,Ind. Y1 ..107.00
Johnstown,Pa. B2 ....107.00
Lackawanna,N.Y. B2.107.00
LosAngeles B3 .....127.00
Massillon,O. R2 .....107.00
Midland,Pa. C18 .....107.00
Munhall,Pa. U5 .....107.00
S.Chicago R2,U5,W14 .107.00
S.Duquesne,Pa. U5 ..107.00
Struthers,O. Y1 .....107.00
Warren,O. C17 .....107.00

ROUNDS, SEAMLESS TUBE (NT)

Bridgeport,Conn. N19 $116.50
Buffalo R2 .....111.50
Canton,O. R2 .....114.00
Cleveland,O. R2 .....111.50
Gary,Ind. U5 .....111.50
S.Chicago,Ill. R2,W14.111.50
S.Duquesne,Pa. U5 ..111.50

SKELP

Aliquippa,Pa. J5 ....4.725
LoneStar,Tex. L6 .....5.025
Munhall,Pa. U5 .....4.625
Warren,O. R2 .....4.625
Youngstown R2, U5 ..4.625

WIRE RODS

AlabamaCity,Ala. R2 ..5.80
Aliquippa,Pa. J5 .....5.80
Alton,Ill. L1 .....6.00
Buffalo W12 .....5.80
Cleveland A7 .....5.80
Donora,Pa. A7 .....5.80
Fairfield,Ala. T2 .....5.80
Houston S5 .....6.05
IndianaHarbor,Ind. Y1 ..5.80
Johnstown,Pa. B2 .....5.80
Joliet,Ill. A7 .....5.80
KansasCity,Mo. S5 ....6.05
Kokomo,Ind. C16 .....5.90
LosAngeles B3 .....6.60
Minnequa,Colo. C10 ....6.05
Monessen,Pa. P17 .....5.80
N.Tonawanda,N.Y.B11 ..5.80
Pittsburg,Calif. C11 ....6.60
Portsmouth,O. P12 ....5.80
Roebling,N.J. R5 .....5.90
S.Chicago,Ill. R2 .....5.80
SparrowsPoint,Md. B2 ..5.90
Sterling,Ill.(1) N15 ...5.80
Sterling,Ill. N15 .....5.90
Struthers,O. Y1 .....5.80
Worcester,Mass. A7 ....6.10

STRUCTURALS

Carbon Steel Std. Shapes

Ala.City,Ala. R2 .....5.00
Atlanta A11 .....5.20
Aliquippa,Pa. J5 .....5.00
Bessemer,Ala. T2 .....5.00
Bethlehem,Pa. B2 .....5.05
Birmingham C15 .....5.00
Clairton,Pa. U5 .....5.00
Fairfield,Ala. T2 .....5.00
Fontana,Calif. K1 .....5.75
Gary,Ind. U5 .....5.00
Geneva,Utah C11 .....5.00
Houston S5 .....5.10
Ind.Harbor,Ind. I-2 ....5.00
Johnstown,Pa. B2 .....5.05
Joliet,Ill. P22 .....5.00
KansasCity,Mo. S5 ....5.10
Lackawanna,N.Y. B2 ..5.05
LosAngeles B3 .....5.70
Minnequa,Colo. C10 ....5.30
Munhall,Pa. U5 .....5.00
Niles,Calif. P1 .....5.65
Phoenixville,Pa. P4 ....5.85
Portland,Oreg. O4 .....5.75
Seattle B3 .....5.75
S.Chicago,Ill. U5, W14.5.00
S.SanFrancisco B3 ....5.65
Sterling,Ill. N15 .....5.00
Torrance,Calif. C11 ....5.70
Weirton,W.Va. W6 ....5.00

Wide Flange

Bethlehem,Pa. B2 .....5.05
Clairton,Pa. U5 .....5.00
Fontana,Calif. K1 .....5.90
IndianaHarbor,Ind. I-2 .5.25
Lackawanna,N.Y. B2 ..5.05
Munhall,Pa. U5 .....5.00
Phoenixville,Pa. P4 ....5.85
S.Chicago,Ill. U5 .....5.00

Alloy Std. Shapes

Aliquippa,Pa. J5 .....6.20
Clairton,Pa. U5 .....6.20
Gary,Ind. U5 .....6.20
Houston S5 .....6.30
Munhall,Pa. U5 .....6.20
S.Chicago,Ill. U5 .....6.20

H.S., L.A. Std. Shapes

Aliquippa,Pa. J5 .....7.35
Bessemer,Ala. T2 .....7.35
Bethlehem,Pa. B2 .....7.40
Clairton,Pa. U5 .....7.35
Fairfield,Ala. T2 .....7.35
Fontana,Calif. K1 ....8.10
Gary,Ind. U5 .....7.35
Geneva,Utah C11 .....7.35
Houston S5 .....7.45
Ind.Harbor,Ind. I-2, Y1.7.35
Lackawanna,N.Y. B2 ..7.40
KansasCity,Mo. S5 ....7.45
Lackawanna,N.Y. B2 ..7.40
LosAngeles B3 .....8.05
Munhall,Pa. U5 .....7.35
Seattle B3 .....8.10
S.Chicago,Ill. U5, W14..7.35
S.SanFrancisco B3 ....8.00
Struthers,O. Y1 .....7.35

H.S., L.A. Wide Flange

Bethlehem,Pa. B2 .....7.40
Lackawanna,N.Y. B2 ..7.40
Munhall,Pa. U5 .....7.35
S.Chicago,Ill. U5 .....7.35

PILING

BEARING PILES

Bethlehem,Pa. B2 .....5.05
Lackawanna, N.Y. B2 ..5.05
Munhall,Pa. U5 .....5.00
S.Chicago,Ill. U5 .....5.00

STEEL SHEET PILING

Lackawanna,N.Y. B2 ..5.90
Munhall,Pa. U5 .....5.90
S.Chicago,Ill. U5 .....5.90

PLATES

PLATES, Carbon Steel

Ala.City,Ala. R2 .....4.85
Aliquippa,Pa. J5 .....4.85
Ashland,Ky.(15) A10 ..4.85
Bessemer,Ala. T2 .....4.85
Clairton,Pa. U5 .....4.85
Claymont,Del. C22 ....5.70
Cleveland J5, R2 .....4.95
Coatesville,Pa. L7 .....5.25
Conshohocken,Pa. A3 ..4.95
Detroit M1 .....4.95
Ecorse,Mich. G5 .....4.95
Fairfield,Ala. T2 .....4.85
Fontana,Calif.(30) K1 ..5.60
Gary,Ind. U5 .....4.85
Geneva,Utah C11 .....4.85
GraniteCity,Ill. G4 ....5.05
Harrisburg,Pa. P4 ....5.80
Houston S5 .....4.95
Ind.Harbor,Ind. I-2, Y1 4.85
Johnstown,Pa. B2 .....4.85
Lackawanna,N.Y. B2 ..4.85
LoneStar,Tex. L6 .....5.20
Minnequa,Colo. C10 ....5.70
Munhall,Pa. U5 .....4.85
Newport,Ky. A2 .....4.85
Pittsburgh J5 .....4.85
Riverdale,Ill. A1 .....4.85
Seattle B3 .....5.75
Sharon,Pa. S3 .....4.85
S.Chicago,Ill. U5, W14 4.85
SparrowsPoint,Md. B2 ..4.85
Sterling,Ill. N19 .....4.85
Steubenville,O. W10 ....4.85
Warren,O. R2 .....4.85
Youngstown R2, U5, Y1.4.85

PLATES, Carbon Abras. Resist.

Claymont,Del. C22 ....6.20
Fontana,Calif. K1 .....7.00
Geneva,Utah C11 .....6.25
Johnstown,Pa. B2 .....5.65
SparrowsPoint,Md. B2 ..5.65

PLATES, Wrought Iron

Economy,Pa. B14 ....11.95

PLATES, H.S., L.A.

Aliquippa,Pa. J5 .....7.25
Bessemer,Ala. T2 .....7.25
Clairton,Pa. U5 .....7.25
Claymont,Del. C22 .....7.55
Cleveland J5, R2 .....7.25
Coatesville,Pa. L7 .....7.55
Conshohocken,Pa. A3 ..7.25
Ecorse,Mich. G5 .....7.35
Fairfield,Ala. T2 .....7.25
Fontana,Calif.(30) K1 ..8.00
Gary,Ind. U5 .....7.25
Geneva,Utah C11 .....7.25
Houston S5 .....7.35
Ind.Harbor,Ind. I-2, Y1..7.25
Johnstown,Pa. B2 .....7.25
Munhall,Pa. U5 .....7.25
Pittsburgh J5 .....7.25
Seattle B3 .....8.15
Sharon,Pa. S3 .....7.25
S.Chicago,Ill. U5, W14..7.25
SparrowsPoint,Md. B2 ..7.25
Warren,O. R2 .....7.25
Youngstown U5, Y1 ....7.25

PLATES, Alloy

Aliquippa,Pa. J5 .....6.85
Claymont,Del. C22 ....6.85
Coatesville,Pa. L7 .....6.85
Fontana,Calif.(30) K1 ..7.60
Gary,Ind. U5 .....6.85
Houston S5 .....6.95
Ind.Harbor,Ind. Y1 ....6.85
Johnstown,Pa. B2 .....6.85
Munhall,Pa. U5 .....6.85
Newport,Ky. A2 .....6.85
Pittsburgh J5 .....6.85
Seattle B3 .....7.75
Sharon,Pa. S3 .....6.85
S.Chicago,Ill. U5, W14..6.85
SparrowsPoint,Md. B2 ..6.85
Youngstown Y1 .....6.85

FLOOR PLATES

Cleveland J5 .....5.925
Conshohocken,Pa. A3 ..5.925
Harrisburg,Pa. P4 ....6.275
Ind.Harbor,Ind. I-2 ..5.925
Munhall,Pa. U5 .....5.925
S.Chicago,Ill. U5 ....5.925

PLATES, Ingot Iron

Ashland c.l. (15) A10..5.10
Ashland l.c.l. (15) A10..5.60
Cleveland c.l. R2 .....5.60
Warren,O. c.l. R2 .....5.60

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)

Ala.City,Ala.(9) R2 ..5.075
Aliquippa,Pa.(9) J5 ....5.075
Alton,Ill. L1 .....5.275
Atlanta(9) A11 .....5.275
Bessemer,Ala.(9) T2 ..5.075
Birmingham(9) C15 ....5.075
Bridgeport,Conn. N19 ..5.30
Buffalo(9) R2 .....5.075
Clairton,Pa.(9) U5 ....5.075
Cleveland(9) R2 .....5.075
Ecorse,Mich.(9) G5 ....5.175
Emeryville,Calif. J7 ..5.825
Fairfield,Ala.(9) T2 ..5.075
Fairless,Pa.(9) U5 ....5.225
Fontana,Calif.(9) K1 ..5.775
Gary,Ind.(9) U5 .....5.075
Houston(9) S5 .....5.325
Ind.Harbor(9) I-2, Y1..5.075
Johnstown,Pa.(9) B2 ..5.075
Joliet,Ill. P22 .....5.075
KansasCity,Mo.(9) S5..5.325
Lackawanna(9) B2 ....5.075
LosAngeles(9) B3 ....5.775
Milton,Pa. M18 .....5.225
Minnequa,Colo. C10 ...5.525
Niles,Calif. P1 .....5.775
N.T'wanda,N.Y.(9)B11 5.425
Pittsburg,Calif.(9) C11.5.775
Pittsburgh(9) J5 .....5.075
Portland,Oreg. O4 ....5.825
Seattle B3, N14 .....5.825
S Ch'e'go(9)R2,U5,W14 5.075
S.Duquesne,Pa.(9) U5..5.075
S SanFran.,Calif.(9)B3 5.825
Sterling,Ill.(1) N15 ....5.075
Sterling,Ill. N15 .....5.175
Struthers,O. Y1 .....5.075
Tonawanda,N.Y. B12 ..5.45
Torrance,Calif.(9) C11 5.775
Youngstown(9) R2, U5 5.075

BARS, H.R. Leaded Alloy (Including leaded extra)

Warren,O. C17 .....7.125

BARS, Hot-Rolled Alloy

Aliquippa,Pa. J5 ....6.125
Bethlehem,Pa. B2 ....6.125
Bridgeport,Conn. N19 ..6.20
Buffalo R2 .....6.125
Canton,O. R2 .....6.125
Clairton,Pa. U5 .....6.125
Detroit S41 .....6.125
Ecorse,Mich. G5 .....6.225
Fairless,Pa. U5 .....6.275
Fontana,Calif. K1 ....7.175
Gary,Ind. U5 .....6.125
Houston S5 .....6.375
Ind.Harbor,Ind. I-2, Y1.6.125
Johnstown,Pa. B2 .....6.125
KansasCity,Mo. S5 ....6.375
Lackawanna,N.Y. B2 ..6.125
LosAngeles B3 .....7.175
Massillon,O. R2 .....6.125
Midland,Pa. C18 .....6.125
Pittsburgh J5 .....6.125
S.Chicago R2,U5,W14 ..6.125
S.Duquesne,Pa. U5 ....6.125
Struthers,O. Y1 .....6.125
Warren,O. C17 .....6.125
Youngstown U5 .....6.125

BARS & SMALL SHAPES, H.R. High-Strength Low-Alloy

Aliquippa,Pa. J5 .....7.425
Bessemer,Ala. T2 .....7.425
Bethlehem,Pa. B2 ....7.425
Bridgeport,Conn. N19 ..7.50
Clairton,Pa. U5 .....7.425
Cleveland R2 .....7.425
Ecorse,Mich. G5 .....7.525
Fairfield,Ala. T2 .....7.425
Fontana,Calif. K1 ....8.125
Gary,Ind. U5 .....7.425
Houston S5 .....7.675
Ind.Harbor,Ind. Y1 ....7.425
Johnstown,Pa. B2 ....7.425
KansasCity,Mo. S5 ....7.675
Lackawanna,N.Y. B2..7.425
LosAngeles B3 .....8.125
Pittsburgh J5 .....7.425
Seattle B3 .....8.175
Sharon,Pa. S3 .....7.425
S.Chicago,Ill. U5, W14..7.425
S.Duquesne,Pa. U5 ....7.425
S.SanFrancisco B3 ....8.175
Struthers,O. Y1 .....7.425
Youngstown U5 .....7.425

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa.(9) B2 ..5.225
Houston(9) S5 .....5.325
KansasCity,Mo.(9) S5..5.325
Lackawanna(9) B2 ....5.075
Sterling,Ill. N15 .....5.175
Sterling,Ill.(1) N15 ....5.075
Tonawanda,N.Y. B12 ...5.45

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5 .....5.075
Atlanta A11 .....5.575
Joliet,Ill. P22 .....5.075
Niles,Calif. P1 .....5.85
Pittsburgh J5 .....5.075
Portland,Oreg. O4 .....5.85
SanFrancisco S7 .....5.95

BAR SHAPES, Hot-Rolled Alloy

Aliquippa,Pa. J5 .....6.20
Clairton,Pa. U5 .....6.20
Gary,Ind. U5 .....6.20
Houston S5 .....6.45
KansasCity,Mo. S5 .....6.45
Pittsburgh J5 .....6.20
Youngstown U5 .....6.20

BARS, C.F., Leaded Alloy (Including leadrd extra)

Ambridge,Pa. W18 ....9.475
BeaverFalls,Pa. M12 ..9.475
Chicago W18 .....9.475
Cleveland C20 .....9.475
LosAngeles S30 .....11.10
LosAngeles P2 .....11.35
Monaca,Pa. S17 .....9.475
Newark,N.J. W18 .....9.65
Warren,O. C17 .....9.475

BARS, Cold-Finished Carbon

Ambridge,Pa. W18 ....6.85
BeaverFalls,Pa. M12,R2.6.85
Birmingham C15 .....7.45
Bridgeport,Conn. N19 ..7.20
Buffalo B5 .....6.90
Camden,N.J. P13 .....7.30
Carnegie,Pa. C12 .....6.85
Chicago W18 .....6.85
Cleveland A7, C20 ....6.85
Detroit B5, P17 .....7.05
Detroit S41 .....6.85
Donora,Pa. W8 .....6.85
Elyria,O. W8 .....6.85
FranklinPark,Ill. N5 ...6.85
Gary,Ind. U5 .....6.85
GreenBay,Wis. F7 .....6.85
Hammond,Ind. L2, M13.6.85
Hartford,Conn. R2 .....7.35
Harvey,Ill. B5 .....6.85
LosAngeles(49) S30 ....8.30
LosAngeles R2 .....8.75
LosAngeles P2 .....8.30
Mansfield,Mass. B5 ....7.40
Massillon,O. R2, R8 ...6.85
Midland,Pa. C18 .....6.85
Monaca,Pa. S17 .....6.85
Newark,N.J. W18 .....7.30
NewCastle,Pa. (17) B4..6.85
Pittsburgh J5 .....6.85
Plymouth,Mich. P5 ....7.10
Putnam,Conn. W18 .....7.40
Readville,Mass. C14 ....7.40
S.Chicago,Ill. W14 ....6.85
SpringCity,Pa. K3 .....7.30
Struthers,O. Y1 .....6.85
Waukegan,Ill. A7 .....6.85
Youngstown F3, Y1 ....6.85

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland,Md.(5) C19.6.10

BARS, Cold-Finished Alloy

Ambridge,Pa. W18 ....8.325
BeaverFalls,Pa. M12,R2 8.325
Bethlehem,Pa. B2 .....8.325
Bridgeport,Conn. N19 ..8.475
Buffalo B5 .....8.325
Camden,N.J. P13 .....8.50
Canton,O. T7 .....8.325
Carnegie,Pa. C12 .....8.325
Chicago W18 .....8.325
Cleveland A7, C20 ....8.325
Detroit B5, P17 .....8.525
Detroit S41 .....8.325
Donora,Pa. A7 .....8.325
Elyria,O. W8 .....8.325
FranklinPark,Ill. N5 ..8.325
Gary,Ind. R2 .....8.325
GreenBay,Wis. F7 .....8.325
Hammond,Ind. L2,M13 8.325
Hartford,Conn. R2 .....8.625
Harvey,Ill. B5 .....8.325
Lackawanna,N.Y. B2 ..8.325
LosAngeles S30 .....10.10
LosAngeles P2 .....10.20
Mansfield,Mass. B5 ....8.625
Massillon,O. R2, R8 ...8.325
Midland,Pa. C18 .....8.325
Monaca,Pa. S17 .....8.325
Newark,N.J. W18 .....8.50
Plymouth,Mich. P5 ....8.525
S.Chicago W14 .....8.325
SpringCity,Pa. K3 .....8.50
Struthers,O. Y1 .....8.325
Warren,O. C17 .....8.325
Waukegan,Ill. A7 .....8.325
Worcester,Mass. A7 ....8.625
Youngstown F3, Y1 ....8.325

BARS, Reinforcing (To Fabricators)

Ala.City,Ala. R2 .....5.075
Atlanta A11 .....5.275
Birmingham C15 .....5.075
Bridgeport,Conn. N9 ....5.30
Buffalo R2 .....5.075
Cleveland R2 .....5.075
Ecorse,Mich. G5 .....5.425
Emeryville,Calif. J7 ....5.825

Fairfield,Ala. T2 .....5.075
Fairless,Pa. U5 .....5.225
Fontana,Calif. K1 .....5.775
Ft.Worth,Tex.(4) T4 ..5.525
Gary,Ind. U5 .....5.075
Houston S5 .....5.325
Ind.Harbor,Ind. I-2, Y1 5.075
Johnstown,Pa. B2 ....5.075
Joliet,Ill. P22 .....5.075
KansasCity,Mo. S5 ...5.325
Lackawanna,N.Y. B2..5.075
LosAngeles B3 .....5.775
Milton,Pa. M18 .....5.225
Minnequa,Colo. C10 ...5.525
Niles,Calif. P1 .....5.775
Pittsburg,Calif. C11 ...5.775
Pittsburgh J5 .....5.075
Portland,Oreg. O4 ....5.825
SandSprings,Okla. S5 ..5.575
Seattle B3, N14 .....8.825
S.Chicago,Ill. R2 .....5.075
S.Duquesne,Pa. U5 ....5.075
S.SanFrancisco B3 ....5.825
SparrowsPoint,Md. B2..5.075
Sterling,Ill.(1) N15 ...5.075
Sterling,Ill. N15 .....5.175
Struthers,O. Y1 .....5.075
Tonawanda,N.Y. B12 ..5.65
Torrance,Calif. C11 .. 5.775
Youngstown R2, U5 ...5.075

BARS, Reinforcing (Fabricated; to Consumers)

Boston B2 .....7.30
Chicago U8 .....6.81
Cleveland U8 .....6.79
Johnstown,Pa. ¼-1" B2 6.73
KansasCity,Mo. S5 .....7.00
Lackawanna,N.Y. B2 ..6.50
Marion,O. P11 .....6.70
NewYork U8 .....7.20
Pittsburgh J5, U8 .....6.75
Seattle B3, N14 .....7.20
SparrowsPt. ½-1" B2 ..6.73
Williamsport,Pa. S19 ..6.65

RAIL STEEL BARS

ChicagoHts.(3) C2, I-2 5.075
ChicagoHts.(4)(44) I-2 5.075
ChicagoHts.(4) C2 ....5.075
Ft.Worth,Tex.(26) T4..5.525
Franklin,Pa.(3) F5 ....5.10
Franklin,Pa.(4) F5 ...5.075
JerseyShore,Pa.(4) J8 ..5.10
Marion,O.(3) P11 .....5.10
Moline,Ill.(3) R2 .....5.225
Tonawanda(3) B12 ....5.15
Tonawanda(4) B12 ....5.65
Williamsport,Pa.(3) S19.5.15

BARS, Wrought Iron

Economy,Pa.(S.R.)B14 13.15
Economy,Pa.(D.R.)B14 16.35
Economy(Staybolt)B14. 16.80
McK.Rks.(S.R.) L5 ...13.15
McK.Rks.(D.R.) L5 ...18.00
McK.Rks.(Staybolt) L5 19.15

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

Ala.City,Ala. R2 .....4.675
Allenport,Pa. P7 .....4.675
Ashland,Ky.(8) A10 ...4.675
Cleveland J5, R2 .....4.675
Conshohocken,Pa. A3 ..4.725
Detroit(8) M1 .....4.775
Ecorse,Mich. G5 .....4.775
Fairfield,Ala. T2 .....4.675
Fairless,Pa. U5 .....4.725
Fontana,Calif. K1 ....5.525
Gary,Ind. U5 .....4.675
Geneva,Utah C11 .....4.775
GraniteCity,Ill.(8) G4..4.875
Ind.Harbor,Ind. I-2, Y1 4.675
Irvin,Pa. U5 .....4.675
Lackawanna,N.Y. B2..4.675
Munhall,Pa. U5 .....4.675
Newport,Ky.(8) A2 ...4.675
Niles,O. M21 .....4.675
Pittsburg,Calif. C11 ..5.375
Pittsburgh J5 .....4.675
Portsmouth,O. P12 ....4.675
Riverdale,Ill. A1 .....4.675
Sharon,Pa. S3 .....4.675
S.Chicago,Ill. W14 ....4.675
SparrowsPoint,Md. B2..4.675
Steubenville,O. W10 ...4.675
Warren,O. R2 .....4.675
Weirton,W.Va. W6 ....4.675
Youngstown U5, Y1 ...4.675

SHEETS, H.R. (19 Ga. & Lighter)

Niles,O. M21 .....5.75

SHEETS, H.R. Alloy

Gary,Ind. U5 .....7.75
Ind.Harbor,Ind. Y1 ....7.75
Irvin,Pa. U5 .....7.75
Newport,Ky. A2 .....7.75
Youngstown U5, Y1 ....7.75

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Cleveland J5, R2.....6.90
Conshohocken,Pa. A3 ..6.95
Ecorse,Mich. G5 .....7.00
Fairfield,Ala. T2 .....6.90
Fairless,Pa. U5 .....6.95
Fontana,Calif. K1 .....7.75
Gary,Ind. U5 .....6.90
Ind.Harbor,Ind. I-2, Y1.6.90
Irvin,Pa. U5 .....6.90
Lackawanna(35) B2 ...6.90
Munhall,Pa. U5 .....6.90
Pittsburgh J5 .....6.90
S.Chicago,Ill. U5 .....6.90
SparrowsPoint(36) B2 ..6.90
Warren,O. R2 .....6.90
Weirton,W.Va. W6 .....6.90
Youngstown U5, Y1 ....6.90

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ..4.925
Cleveland R2 .....5.425
Warren,O. R2 .....5.425

SHEETS, Cold-Rolled Steel (Commercial Quality)

Allenport,Pa. P7 .....5.75
Cleveland J5, R2 .....5.75
Conshohocken,Pa. A3 ...5.80
Detroit M1 .....5.75
Ecorse,Mich. G5 .....5.85
Fairfield,Ala. T2 .....5.75
Fairless,Pa. U5 .....5.80
Follansbee,W.Va. F4 ..5.75
Fontana,Calif. K1 .....7.00
Gary,Ind. U5 .....5.75
GraniteCity,Ill. G4 .....5.95
Ind.Harbor,Ind. I-2, Y1.5.75
Irvin,Pa. U5 .....5.75
Lackawanna,N.Y. B2 ..5.75
Mansfield,O. E6 .....5.75
Middletown,O. A10 ....5.75
Newport,Ky. A2 .....5.75
Pittsburg,Calif. C11 ....6.70
Pittsburgh J5 .....5.75
Portsmouth,O. P12 ....5.75
SparrowsPoint,Md. B2 ..5.75
Steubenville,O. W10 ....5.75
Warren,O. R2 .....5.75
Weirton,W.Va. W6 .....5.75
Yorkville,O. W10 .....5.75
Youngstown Y1 .....5.75

SHEETS, Cold-Rolled High-Strength, Low-Alloy

Cleveland J5, R2 .....8.525
Ecorse,Mich. G5 .....8.625
Fairless,Pa. U5 .....8.575
Fontana,Calif. K1 ....9.775
Gary,Ind. U5 .....8.525
IndianaHarbor,Ind. Y1.8.525
Irvin,Pa. U5 .....8.525
Lackawanna(37) B2 ..8.525
Pittsburgh J5 .....8.525
SparrowsPoint(38) B2.8.525
Warren,O. R2 .....8.525
Weirton,W.Va. W6 ....8.525
Youngstown Y1 .....8.525

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....6.50
Middletown,O. A10 ....6.25
Warren,O. R2 .....6.50

SHEETS, Culvert

	Cu Steel	Cu Fe
Ashland,Ky. A10	6.65	6.90
Canton,O. R2	6.65	7.15
Fairfield T2	6.65	6.90
Gary,Ind. U5	6.65	6.90
GraniteCity,Ill. G4	6.85	...
Ind.Harbor I-2	6.65	6.90
Irvin,Pa. U5	6.65	6.90
Kokomo,Ind. C16	6.75	...
MartinsFry. W10	6.65	6.90
Pittsburgh J5	6.65	...
Pitts.,Calif. C11	7.40	...
SparrowsPt. B2	6.65	...

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 ....6.90

SHEETS, Galvanized Steel Hot-Dipped

Ala.City,Ala. R2 .....6.30‡
Ashland,Ky. A10 .....6.30†
Canton,O. R2 .....6.30‡
Dover,O. R1 .....6.30†
Fairfield,Ala. T2 .....6.30†
Gary,Ind. U5 .....6.30†
GraniteCity,Ill. G4 ....6.50•
Ind.Harbor,Ind. I-2 ...6.30†
Irvin,Pa. U5 .....6.30†
Kokomo,Ind. C16 .....6.40‡
MartinsFerry,O. W10 ..6.30•
Middletown,O. A10 ...6.30†
Pittsburg,Calif. C11 ...7.05•
Pittsburgh J5 .....6.30†
SparrowsPt.,Md. B2 ...6.30†
Warren,O. R2 .....6.30†
Weirton,W.Va. W6 ....6.30•

•Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1 .....7.025

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....9.275
SparrowsPoint(39) B2..9.275

SHEETS, Galvannealed Steel

Canton,O. R2 .....6.70
Irvin,Pa. U5 .....6.70

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 .....6.55
Middletown,O. A10 .....6.55

SHEETS, Electrogalvanized

Cleveland(28) R2 .....7.125
Niles,O.(28) R2 .....7.125
Weirton,W.Va. W6 ....6.975

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1).8.95
Butler,Pa. A10 (type 2).9.05

SHEETS, Enameling Iron

Ashland,Ky. A10 .....6.325
Cleveland R2 .....6.325
Gary,Ind. U5 .....6.325
GraniteCity,Ill. G4 ....6.525
Ind.Harbor,Ind. I-2, Y1 6.325
Irvin,Pa. U5 .....6.325
Middletown,O. A10 ....6.325
Niles,O. M21 .....6.325
Youngstown Y1 .....6.325

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4 ..8.35
Ind.Harbor,Ind. I-2 ...8.175
Yorkville,O. W10 .....8.175

SHEETS, Long Terne Steel (Commercial Quality)

BeechBottom,W.Va. W10 6.70
Gary,Ind. U5 .....6.70
Mansfield,O. E6 .....6.70
Middletown,O. A10 ....6.70
Niles,O. M21 .....6.70
Weirton,W.Va. W6 .....6.70

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10 ....7.10

Key To Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U.S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.
B1 Babcock & Wilcox Co.
B2 Bethlehem Steel Co.
B3 Beth. Pac. Coast Steel
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B11 Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.
C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C4 Carpenter Steel Co.
C7 Cleve. Cold Rolling Mills
C8 Cold Metal Products Co.
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co. Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.
D2 Detroit Steel Corp.
D3 Dearborn Division, Sharon Steel Corp.
D4 Disston Division, H. K. Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.
E1 EasternGas&FuelAssoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire Steel Corp.
F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.
G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
H1 Hanna Furnace Corp.
H7 Helical Tube Co.
I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins, E., Steel Tube
I-7 Indiana Steel & Wire Co.
J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.
K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.
L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L5 Lockhart Iron & Steel
L6 Lone Star Steel Co.
L7 Lukens Steel Co.
M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M13 Monarch Steel Div., Jones & Laughlin Steel Corp.
M14 McInnes Steel Co.
M16 Md. Fine & Special. Wire
M17 Metal Forming Corp.
M18 Milton Steel Division, Merritt-Chapman&Scott
M21 Mallory-Sharon Titanium Corp.
M22 Mill Strip Products Co.
N1 National Standard Co.
N2 National Supply Co.
N3 National Tube Div., U.S. Steel Corp.
N5 Nelsen Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N9 Newport Steel Corp.
N14 Northwest.SteelRoll.Mill
N15 Northwestern S.&W. Co.
N19 Northeastern Steel Corp.
O4 Oregon Steel Mills
P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co., Sub. of Barium Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Division, Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts.Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., Amer. Chain & Cable
P17 Plymouth Steel Co.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
R1 Reeves Steel & Mfg. Co.
R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div.,EatonMfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.
S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Steel Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Corp.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service
S41 Stainless Steel Div., J&L Steel Corp.
T2 Tenn.Coal & Iron Div., U.S. Steel Corp.
T3 Tenn. Prod. & Chem.
T4 Texas Steel Co.
T5 Thomas Strip Division, Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.
U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U5 U.S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U.S. Steel Supply Div., U.S. Steel Corp.
V2 Vanadium-Alloys Steel
V3 Vulcan Crucible Div., H. K. Porter Co. Inc.
W1 Wallace Barnes Co.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.
Y1 Youngstown Sheet&Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2	4.675
Allenport,Pa. P7	4.675
Alton,Ill. L1	4.875
Ashland,Ky.(8) A10	4.675
Atlanta A11	4.875
Bessemer,Ala. T2	4.675
Birmingham C15	4.675
Buffalo(27) R2	4.675
Conshohocken,Pa. A3	4.725
Detroit M1	4.775
Ecorse,Mich. G5	4.775
Fairfield,Ala. T2	4.675
Fontana,Calif. K1	5.525
Gary,Ind. U5	4.675
Houston S5	4.925
Ind.Harbor,Ind. I-2, Y1	4.675
Johnstown,Pa.(25) B2	4.675
KansasCity,Mo. S5	4.925
Lackaw'na,N.Y.(25) B2	4.675
LosAngeles(25) B3	5.425
Minnequa,Colo. C10	5.775
Pittsburg,Calif. C11	5.425
Riverdale,Ill. A1	4.675
SanFrancisco S7	5.95
Seattle(25) B3	5.675
Seattle N14	5.675
Sharon,Pa. S3	4.675
S.Chicago,Ill. W14	4.675
S.SanFrancisco(25) B3	5.425
SparrowsPoint,Md. B2	4.675
Sterling,Ill.(1) N15	4.675
Sterling,Ill. N15	4.775
Torrance,Calif. C11	5.425
Warren,O. R2	4.675
Weirton,W.Va. W6	4.675
Youngstown U5	4.675

STRIP, Hot-Rolled Alloy

Carnegie,Pa. S18	7.75
Gary,Ind. U5	7.75
Ind.Harbor,Ind. Y1	7.75
LosAngeles B3	8.95
Newport,Ky. A2	7.75
Sharon,Pa. S3	7.75
S.Chicago,Ill. W14	7.75
Youngstown U5, Y1	7.75

STRIP, Hot-Rolled High-Strength, Low-Alloy

Bessemer,Ala. T2	6.95
Conshohocken,Pa. A3	6.95
Ecorse,Mich. G5	7.05
Fairfield,Ala. T2	6.95
Gary,Ind. U5	6.95
Houston S5	7.20
Ind.Harbor,Ind. I-2, Y1	6.95
KansasCity,Mo. S5	7.20
Lackawanna,N.Y. B2	6.95
LosAngeles(25) B3	7.70
Seattle(25) B3	7.95
Sharon,Pa. S3	6.95
S.SanFrancisco(25) B3	7.70
SparrowsPoint,Md. B2	6.95
Warren,O. R2	6.95
Weirton,W.Va. W6	6.95
Youngstown U5, Y1	6.95

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	4.925
Warren,O. R2	5.425

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	6.85
Baltimore T6	6.85
Boston T6	7.40
Buffalo S40	6.85
Cleveland A7, J5	6.85
Conshohocken,Pa. A3	6.90
Dearborn,Mich. D3	6.95
Detroit D2, M1, P20	6.95
Dover,O. G6	6.85
Ecorse,Mich. G5	6.95
Evanston,Ill. M22	6.95
Follansbee,W.Va. F4	6.85
Fontana,Calif. K1	8.70
FranklinPark,Ill. T6	6.95
Ind.Harbor,Ind. Y1	6.85
Indianapolis C8	7.00
LosAngeles C1	8.90
NewBedford,Mass. R10	7.30
NewBritain(10) S15	6.85
NewCastle,Pa. B4, E5	6.85
NewHaven,Conn. D2	7.30
NewKensington,Pa. A6	6.85
Pawtucket,R.I. R3	7.50
Pawtucket,R.I. N8	7.40
Pittsburgh J5	6.85
Riverdale,Ill. A1	6.95
Rome,N.Y.(32) R6	6.85
Sharon,Pa. S3	6.85
Trenton,N.J.(31) R5	8.30
Wallingford,Conn. W2	7.30
Warren,O. R2, T5	6.85
Weirton,W.Va. W6	6.85
Worcester,Mass. A7	7.40
Youngstown C8, Y1	6.85

STRIP, Cold-Rolled Alloy

Boston T6	14.90
Carnegie,Pa. S18	14.55
Cleveland A7	14.55
Dover,O. G6	14.55
FranklinPark,Ill. T6	14.55
Harrison,N.J. C18	14.55
Indianapolis C8	14.70
Pawtucket,R.I. N8	14.90
Sharon,Pa. S3	14.55
Worcester,Mass. A7	14.85
Youngstown C8	14.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	10.00
Dearborn,Mich. D3	10.10
Dover,O. G6	10.10
Ecorse,Mich. G5	10.10
Ind.Harbor,Ind. Y1	10.20
Sharon,Pa. S3	10.00
Warren,O. R2	10.00
Weirton,W.Va. W6	10.00
Youngstown Y1	10.20

STRIP, Cold-Finished Spring Steel (Annealed)

	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	9.20	10.40	12.60	15.60	18.55
Boston T6	9.20	10.40	12.60	15.60	18.55
Bristol,Conn. W1	....	10.40	12.60	15.60	18.55
Carnegie,Pa. S18	8.65	10.10	12.30	15.30	....
Cleveland A7	8.65	10.10	12.30	15.30	18.25
Cleveland C7	....	10.10	12.30	15.30	18.25
Dearborn,Mich. D3	8.75	10.20	12.40	....	....
Detroit D2	8.75	10.20	12.40	15.40	....
Dover,O. G6	8.65	10.10	12.30	15.30	18.25
Evanston,Ill. M22	8.65	10.10	12.30	....	....
FranklinPark,Ill. T6	8.75	10.10	12.30	15.30	18.25
Harrison,N.J. C18	....	....	12.60	15.60	18.55
Indianapolis C8	8.80	10.25	12.30	15.30	18.25
LosAngeles C1	10.85	12.30	14.50	....	....
NewBritain,Conn.(10) S15	8.65	10.10	12.30	15.30	18.25
NewCastle,Pa. B4, E5	8.65	10.10	12.30	15.30	....
NewHaven,Conn. D2	9.10	10.40	12.60	15.60	....
NewKensington,Pa. A6	8.65	10.10	12.30	15.30	....
New York W3	....	10.40	12.60	15.60	18.55
Pawtucket,R.I. N8	9.20	10.40	12.60	15.60	18.55
Riverdale,Ill. A1	8.75	10.10	12.30	15.30	18.25
Rome,N.Y.(32) R6	8.65	10.10	12.30	15.30	18.25
Sharon,Pa. S3	8.65	10.10	12.30	15.30	18.25
Trenton,N.J. R5	....	10.40	12.60	15.60	18.55
Wallingford,Conn. W2	9.10	10.40	12.60	15.60	18.45
Warren,O. T5	8.65	10.10	12.30	15.30	18.25
Worcester,Mass. A7, T6	9.20	10.40	12.60	15.60	18.55
Youngstown C8	8.65	10.10	12.30	15.30	18.25

Spring Steel (Tempered)

	Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	17.10	20.95	25.30
Buffalo W12	17.10	....	....
FranklinPark,Ill. T6	17.45	21.30	25.65
Harrison,N.J. C18	17.10	20.95	25.30
New York W3	17.10	20.95	25.30
Palmer,Mass. W12	17.10	....	....
Trenton,N.J. R5	17.10	20.95	25.30
Worcester,Mass. A7, T6	17.10	20.95	25.30
Youngstown C8	17.45	21.30	25.65

SILICON STEEL

H.R. SHEETS(22 Ga.,cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	....	....	11.00	12.05	13.05
Brackenridge,Pa. A4	....	....	11.00	12.05	13.05
Mansfield,O. E6	9.20	10.35	11.00	12.05	13.05
Newport,Ky. A2	9.20	10.35	11.00	12.05	13.05
Niles,O. M21	9.20	10.35	11.00	12.05	....
Vandergrift,Pa. U5	....	10.35	11.00	12.05	13.05
Warren,O. R2	9.20	10.35	11.00	12.05	....
Zanesville,O. A10	....	10.35	11.00	12.05	13.05
Zanesville,O. A10 (FP coils)	....	10.85	11.525	12.575	13.55
Zanesville,O. A10 (SP coils)	....	....	11.025	12.075	13.05

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge,Pa. A4	....	....	11.525	12.575	13.55
GraniteCity,Ill. G4	9.40*	10.55*	11.225*	12.275*	....
IndianaHarbor,Ind. I-2	9.20†	10.35*	11.025*	12.075*	....
Mansfield,O. E6	9.70	10.85	11.525	12.575	13.55
Vandergrift,Pa. U5	9.20*	10.35*	11.025*	12.075*	13.05*
Vandergrift,Pa. U5	....	10.85†	11.525†	12.575†	13.55†
Warren,O. R2	9.20*	10.85	11.525	12.575	13.55

H.R. SHEETS (22 Ga., cut lengths)	Transformer Grades T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	14.05	14.60	15.10	16.15
Brackenridge,Pa. A4	14.05	....	....	....
Vandergrift,Pa. U5	14.05	14.60	15.10	16.15
Zanesville,O. A10	14.05	14.60	15.10	16.15

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	16.90	18.50	19.00	19.50	....
Butler,Pa. A10	....	....	18.50	19.00	19.50	....
Vandergrift,Pa. U5	15.90	16.90	18.50	19.00	19.50	14.55**
Warren,O. R2	....	....	....	....	....	14.55‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. **Cut lengths, ¾-cent lower.

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2	7.60

STRIP, C.R. Electrogalvanized

Cleveland A7	6.85*
Dover,O. G6	6.85*
Evanston,Ill. M22	6.95
Riverdale,Ill. A1	6.95*
Warren,O. B9, T5	6.85*
Worcester,Mass. A7	7.40*
Youngstown C8	6.85*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	6.975

TIGHT COOPERAGE HOOP

Atlanta A11	5.40
Riverdale,Ill. A1	5.25
Sharon,Pa. S3	5.10
Youngstown U5	5.10

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)

	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$8.75	$9.00	$9.40
Fairfield,Ala. T2	8.85	9.10	9.50
Fairless,Pa. U5	8.85	9.10	9.50
Fontana,Calif. K1	9.50	9.75	10.15
Gary,Ind. U5	8.75	9.00	9.40
GraniteCity,Ill. G4	8.85	9.10	9.50
IndianaHarbor,Ind. I-2, Y1	8.75	9.00	9.40
Irvin,Pa. U5	8.75	9.00	9.40
Niles,O. R2	8.75	9.00	9.40
Pittsburg,Calif. C11	9.50	9.75	10.15
SparrowsPoint,Md. B2	8.85	9.10	9.50
Weirton,W.Va. W6	8.75	9.00	9.40
Yorkville,O. W10	8.75	9.00	9.40

ELECTROTIN (22-27 Gage; Dollars per 100 lb)

Aliquippa,Pa. J5	7.425	7.625	....
Niles,O. R2	7.425	7.625	7.925

TINPLATE, American

	1.25 lb	1.50 lb
Aliquippa,Pa.J5	$10.05	$10.30
Fairfield,Ala.T2	10.15	10.40
Fairless,Pa. U5	10.15	10.40
Fontana,Calif.K1	10.80	11.05
Gary,Ind. U5	10.05	10.30
Irvin,Pa. U5	10.05	10.30
Pitts.,Calif. C11	10.80	11.05
Sp.Pt.,Md. B2	10.15	10.40
Weirton,W.Va.W6	10.05	10.30
Yorkville,O. W10	10.05	10.30

BLACK PLATE (Base Box)

Aliquippa,Pa. J5	$7.85
Fairfield,Ala. T2	7.95
Fairless,Pa. U5	7.95
Fontana,Calif. K1	8.60
Gary,Ind. U5	7.85
GraniteCity,Ill. G4	7.95
Ind.Harbor,Ind. I-2, Y1	7.85
Irvin,Pa. U5	7.85
Niles,O. R2	7.85
Pittsburg,Calif. C11	8.60
SparrowsPoint,Md. B2	7.95
Weirton,W.Va. W6	7.85
Yorkville,O. W10	7.85

HOLLOWARE ENAMELING Black Plate (29 Gage)

Aliquippa,Pa. J5	$7.50
Gary,Ind. U5	7.50
GraniteCity,Ill. G4	7.60
Ind.Harbor,Ind. Y1	7.50
Irvin,Pa. U5	7.50
Yorkville,O. W10	7.50

MANUFACTURING TERNES (Special Coated; Base Box)

Gary,Ind. U5	$9.70
Irvin,Pa. U5	9.70

ROOFING SHORT TERNES (8 lb Coated; Base Box)

Gary,Ind. U5	$11.25

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	7.20
Aliquippa,Pa. J5	7.20
Alton,Ill. L1	7.40
Atlanta A11	7.40
Bartonville,Ill. K4	7.30
Buffalo W12	7.20
Chicago W13	7.20
Cleveland A7, C20	7.20
Crawfordsville,Ind. M8	7.30
Donora,Pa. A7	7.20
Duluth A7	7.20
Fairfield,Ala. T2	7.20
Fostoria,O.(24) S1	7.30
Houston S5	7.45
Jacksonville,Fla. M8	7.55
Johnstown,Pa. B2	7.20
Joliet,Ill. A7	7.20
KansasCity,Mo. S5	7.45
Kokomo,Ind. C16	7.30
LosAngeles B3	8.15
Minnequa,Colo. C10	7.45
Monessen,Pa. P7, P16	7.20
N.Tonawanda,N.Y. B11	7.20
Palmer,Mass. W12	7.50
Pittsburg,Calif. C11	8.15
Portsmouth,O. P12	7.20
Rankin,Pa. A7	7.20
S.Chicago,Ill. R2	7.20
S.SanFrancisco C10	8.15
SparrowsPoint,Md. B2	7.30
Sterling,Ill.(1) N15	7.20
Sterling,Ill. N15	7.30
Struthers,O. Y1	7.20
Waukegan,Ill. A7	7.20
Worcester,Mass. A7	7.50

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	11.90
Buffalo W12	11.90
Cleveland A7	11.90
Donora,Pa. A7	11.90
Duluth A7	11.90
Johnstown,Pa. B2	11.90
Minnequa,Colo. C10	12.025
Monessen,Pa. P16	11.90
Muncie,Ind. I-7	12.10
NewHaven,Conn. A7	12.20
Palmer,Mass. W12	12.20
Pittsburg,Calif. C11	12.70
Portsmouth,O. P12	11.90
Roebling,N.J. R5	12.20
SparrowsPt.,Md. B2	12.00
Struthers,O. Y1	11.90
Trenton,N.J. A7	12.20
Waukegan,Ill. A7	11.90
Worcester,Mass. A7	12.20

WIRE, Upholstery Spring

Aliquippa,Pa. J5	8.70
Alton,Ill. L1	8.90
Buffalo W12	8.70
Cleveland A7	8.70
Donora,Pa. A7	8.70
Duluth A7	8.70
Johnstown,Pa. B2	8.70
KansasCity,Mo. S5	8.95
Minnequa,Colo. C10	8.90
LosAngeles B3	9.65
Monessen,Pa. P7, P16	8.70
NewHaven,Conn. A7	9.00
Palmer,Mass. W12	9.00
Pittsburg,Calif. C11	9.65
Portsmouth,O. P12	8.70
Roebling,N.J. R5	8.70
S.Chicago,Ill. R2	8.70
S.SanFrancisco C10	9.65
SparrowsPt.,Md. B2	8.80
Struthers,O. Y1	8.70
Trenton,N.J. A7	9.00
Waukegan,Ill. A7	8.70
Worcester,Mass. A7	9.00

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	9.025
Alton,Ill. L1	9.225
Bartonville,Ill. K4	9.125
Buffalo W12	9.025
Cleveland A7	9.025
Donora,Pa. A7	9.025
Duluth A7	9.025
Fostoria,O. S1	9.075
Johnstown,Pa. B2	9.025
LosAngeles B3	9.975
Milbury,Mass.(12) N6	9.325
Minnequa,Colo. C10	9.275
Monessen,Pa. P7, P16	9.025
Muncie,Ind. I-7	9.225
Palmer,Mass. W12	9.325
Pittsburg,Calif. C11	9.975
Portsmouth,O. P12	9.025
Roebling,N.J. R5	9.025
S.Chicago,Ill. R2	9.025
S.SanFrancisco C10	9.975
SparrowsPt.,Md. B2	9.125
Struthers,O. Y1	9.025
Trenton,N.J. A7	9.325
Waukegan,Ill. A7	9.025
Worcester J4, T6, W12	9.325
Worcester,Mass. A7	9.325

WIRE, Fine & Weaving(8" Coils)

Alton,Ill. L1	14.65
Bartonville,Ill. K4	14.25
Buffalo W12	14.45
Chicago W13	14.45
Cleveland A7	14.45
Crawfordsville,Ind. M8	14.25
Fostoria,O. S1	14.45
Jacksonville,Fla. M8	14.50
Johnstown,Pa. B2	14.45
Kokomo,Ind. C16	14.45
Monessen,Pa. P7	14.45
Muncie,Ind. I-7	14.65
Palmer,Mass. W12	14.75
Roebling,N.J. C10	14.45
S.SanFrancisco C10	14.80
Waukegan,Ill. A7	14.45
Worcester,Mass. A7, T6	14.75

ROPE WIRE

Bartonville,Ill. K4	12.00
Buffalo W12	12.00
Fostoria,O. S1	12.00
Johnstown,Pa. B2	12.00
Monessen,Pa. P7	12.00
Muncie,Ind. I-7	12.20
Palmer,Mass. W12	12.30
Portsmouth,O. P12	12.00
Roebling,N.J. R5	12.30
SparrowsPt.,Md., B2	12.10
Struthers,O. Y1	12.00
Worcester,Mass. J4	12.30

(A) Plow and Mild Plow: add 0.25c for Improved Plow

WIRE

WIRE, Tire Bead

Bartonville,Ill. K4	15.75
Monessen,Pa. P16	15.45
Roebling,N.J. R5	16.10

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	10.75
Baltimore T6	11.05
Boston T6	11.05
Buffalo W12	10.75
Chicago W13	10.85
Cleveland A7	10.75
Crawfordsville,Ind. M8	10.75
Dover,O. G6	10.75
Fostoria,O. S1	11.05
FranklinPark,Ill. T6	10.85
Kokomo,Ind. C16	10.75
Massillon,O. R8	10.75
Milwaukee C23	10.95
Monessen,Pa. P7, P16	10.75
NewKensington,Pa. A6	10.75
Palmer,Mass. W12	11.05
Pawtucket,R.I. N8	11.05
Riverdale,Ill. A1	10.85
Rome,N.Y. R6	10.75
Trenton,N.J. R5	11.05
Worcester,Mass. A7, T6	11.05

NAILS & POLISHED STAPLES,

Stock	Col.
AlabamaCity,Ala. R2	164
Aliquippa,Pa. J5	164
Atlanta A11	166
Bartonville,Ill. K4	166
Crawfordsville,Ind. M8	166
Donora,Pa. A7	164
Duluth A7	164
Fairfield,Ala. T2	164
Houston,Tex. S5	169
Jacksonville,Fla.(20) M8	175
Johnstown,Pa. B2	164
Joliet,Ill. A7	164
KansasCity,Mo. S5	169
Kokomo,Ind. C16	166
Minnequa,Colo. C10	169
Monessen,Pa. P7	164
Pittsburg,Calif. C11	183
Rankin,Pa. A7	164
S.Chicago,Ill. R2	164
SparrowsPt.,Md. B2	166
Sterling,Ill. (7) N15	166
Worcester,Mass. A7	170

NAILS, Stock

	Col.
Chicago W13	164
Cleveland A9	170

(To Wholesalers; per cwt)

Galveston,Tex. D7	$8.75

NAILS, Cut (100 lb keg)
To Dealers (33)

Conshohocken,Pa. A3	$9.80
Wheeling,W.Va. W10	9.80

TIE WIRE, Automatic Baler (14½ Ga.)(Per 97 lb Net Box)
Coil No. 3150

AlabamaCity,Ala. R2	$9.82
Atlanta A11	9.63
Bartonville,Ill. K4	9.63
Buffalo W12	9.82
Chicago W13	9.82
Crawfordsville,Ind. M8	9.63
Donora,Pa. A7	9.82
Duluth A7	9.82
Fairfield,Ala. T2	9.82
Houston S5	10.07
Jacksonville,Fla. M8	10.09
Johnstown,Pa. B2	9.82
Joliet,Ill. A7	9.82
KansasCity,Mo. S5	10.07
Kokomo,Ind. C16	9.92
LosAngeles B3	10.61
Minnequa,Colo. C10	10.07
Pittsburg,Calif. C11	10.60
S.Chicago,Ill. R2	9.82
S.SanFrancisco C10	10.60
SparrowsPt.,Md. B2	9.92
Sterling,Ill.(37) N15	9.82

Coil No. 6500 Stand.

AlabamaCity,Ala. R2	$10.15
Atlanta A11	9.95
Bartonville,Ill. K4	9.95
Buffalo W12	10.15
Chicago W13	10.15
Crawfordsville,Ind. M8	9.95
Donora,Pa. A7	10.15
Duluth A7	10.15
Fairfield,Ala. T2	10.15
Houston S5	10.40
Jacksonville,Fla. M8	10.41
Johnstown,Pa. B2	10.15
Joliet,Ill. A7	10.15
KansasCity,Mo. S5	10.40
Kokomo,Ind. C16	10.25
LosAngeles B3	10.95
Minnequa,Colo. C10	10.40
Pittsburg,Calif. C11	10.95
S.Chicago,Ill. R2	10.15
S.SanFrancisco C10	10.95
SparrowsPt.,Md. B2	10.25
Sterling,Ill.(37) N15	10.15

Coil Interim

AlabamaCity,Ala. R2	$10.20
Atlanta A11	10.00
Bartonville,Ill. K4	10.00
Buffalo W12	10.20
Chicago W13	10.20
Crawfordsville,Ind. M8	10.00
Donora,Pa. A7	10.20
Duluth A7	10.20
Fairfield,Ala. T2	10.20
Houston S5	10.45
Jacksonville,Fla. M8	10.46
Johnstown,Pa. B2	10.20
Joliet,Ill. A7	10.20
KansasCity,Mo. S5	10.45
Kokomo,Ind. C16	10.30
LosAngeles B3	11.00
Minnequa,Colo. C10	10.45
Pittsburg,Calif. C11	11.00
S.Chicago,Ill. R2	10.20
S.SanFrancisco C10	11.00
SparrowsPt.,Md. B2	10.30
Sterling,Ill. (37) N15	10.20

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	196
Atlanta A11	192
Bartonville,Ill. K4	192
Crawfordsville,Ind. M8	192
Donora,Pa. A7	196
Duluth A7	196
Fairfield,Ala. T2	196
Houston S5	201
Jacksonville,Fla. M8	197
Joliet,Ill. A7	190
KansasCity,Mo. S5	201
Kokomo,Ind. C16	198
Minnequa,Colo. C10	201
Pittsburg,Calif. C11	220
S.SanFrancisco C10	220
SparrowsPt.,Md. B2	198
Tonawanda,N.Y. B12	169
Williamsport,Pa. S19	175

FENCE POSTS

ChicagoHts.,Ill. C2, I-2	167
Duluth A7	167
Franklin,Pa. F5	167
Huntington,W.Va. W7	169
Johnstown,Pa. B2	167
Marion,O. P11	167
Minnequa,Colo. C10	172
Sterling,Ill.(1) N15	167
Tonawanda,N.Y. B12	169
Williamsport,Pa. S19	175

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	184**
Aliquippa,Pa. J5	181§
Atlanta A11	190*
Bartonville,Ill. K4	190
Crawfordsville,Ind. M8	190
Donora,Pa. A7	184†
Duluth A7	184†
Fairfield,Ala. T2	184†
Houston,Tex. S5	189**
Jacksonville,Fla. M8	195
Johnstown,Pa. B2	188*
Joliet,Ill. A7	184†
KansasCity,Mo. S5	189**
Kokomo,Ind. C16	186†
Minnequa,Colo. C10	189**
Monessen,Pa. P7	188*
Pittsburg,Calif. C11	204†
Rankin,Pa. A7	184†
S.Chicago,Ill. R2	184**
S.SanFrancisco C10	204**
SparrowsPoint,Md. B2	190*
Sterling,Ill.(7) N15	190*

WOVEN FENCE, 9-15 Ga.

	Col.
Ala.City,Ala. R2	176**
Aliq'ppa,Pa. 9-14½ga.J5	179§
Atlanta A11	182*
Bartonville,Ill. K4	182
Crawfordsville,Ind. M8	182
Donora,Pa. A7	176†
Duluth A7	176†
Fairfield,Ala. T2	176†
Houston,Tex. S5	181**
Jacksonville,Fla. M8	187
Johnstown,Pa.(43) B2	180*
Joliet,Ill. A7	176†
KansasCity,Mo. S5	181**
Kokomo,Ind. C16	178†
Minnequa,Colo. C10	181**
Monessen,Pa. 9 ga. P7	180*
Pittsburg,Calif. C11	190†
Rankin,Pa. A7	176†
S.Chicago,Ill. R2	176**
Sterling,Ill.(7) N15	182*

WIRE (16 gage)	An'ld Stone	Galv. Stone
Ala.City,Ala.R2	16.00	17.55**
Aliq'ppa,Pa. J5	15.70	17.50
Bartonville K4	15.80	17.75
Cleveland A7	16.00	....
Crawf'dsville M8	15.80	17.75
Fostoria,O. S1	16.50	18.05†
Houston S5	16.25	17.80**
Jacksonville M8	16.05	18.00
Johnstown B2	16.00	17.95*
Kan.City,Mo. S5	16.25	....
Kokomo C16	16.10	17.65†
Minnequa C10	16.25	17.80*
P'lm'r,Mass.W12	16.30	17.85†
Pitts.,Calif. C11	16.35	17.90†
SparrowsPt. B2	16.10	18.05*
Sterling(37) N15	16.00	17.95*
Waukegan A7	16.00	17.55†
Worcester A7	16.30	....

WIRE, Merchant Quality

(6 to 8 gage)	An'ld	Galv.
Ala.City,Ala. R2	8.20	8.75**
Aliquippa J5	7.95	8.475§
Atlanta (48) A11	8.05	8.65*
Bartonville(48) K4	8.05	8.65
Buffalo W12	8.20	8.75†
Cleveland A7	8.20	....
Crawfordsville M8	8.05	8.65
Donora,Pa. A7	8.20	8.75†
Duluth A7	8.20	8.75†
Fairfield T2	8.20	8.75†
Houston(48) S5	8.45	9.00**
Jacks'ville,Fla. M8	8.30	8.90
Johnstown B2(48)	8.20	8.95*
Joliet,Ill. A7	8.20	8.75†
Kans.City(48) S5	8.45	9.00**
Kokomo C16	8.30	8.85†
LosAngeles B3	9.15	9.90*
Minnequa C10	8.45	9.00‡
Monessen P7(48)	7.95	8.55*
Palmer,Mass. W12	8.50	9.05†
Pitts.,Calif. C11	9.15	9.70†
Rankin,Pa. A7	8.20	8.75†
S.Chicago R2	8.20	8.75**
S.SanFran. C10	9.15	9.70*
Spar'wsPt. B2(48)	8.30	9.05*
Sterling(37)(48)N15	8.35	9.10
Struth'rs,O.(48)Y1	8.20	8.85‡
Worcester,Mass.A7	8.50	9.05†

Based on zinc price of: *13.50c. †5c. §10c. ‡Less than 10c. ††13c. **Subject to zinc equalization extras.

FASTENERS

(Base discounts, full container quantity, per cent off list, f.o.b. mill)

BOLTS

Carriage, Machine Bolts
Full Size Body (cut thread)

½ in. and smaller:	
6 in. and shorter	52.5
Longer than 6 in.	43.5
⅝ in. thru 1 in:	
6 in. and shorter	43.5
Longer than 6 in.	41.5
1⅛ in. and larger:	
All lengths	41.5
Undersized Body (rolled thread)	
½ in. and smaller:	
6 in. and shorter	52.5

Carriage, Machine, Lag Bolts
Hot Galvanized:

½ in. and smaller:	
6 in. and shorter	32.0
Longer than 6 in.	19.0
⅝ in. thru 1 in.:	
6 in. and shorter	16.0
Longer than 6 in.	16.0
1⅛ in. and larger:	
All lengths	16.0

Lag Bolts
All diameters:

6 in. and shorter	52.5
Longer than 6 in.	44.5

Plow and Tap Bolts

½ in. and smaller by 6 in. and shorter	52.0
Larger than ½ in. or longer than 6 in.	44.5
Blank Bolts	44.5
Step, Elevator, Tire Bolts	52.0
Stove Bolts, Slotted	
⅛ to ¼-in. incl.. 3 in. and shorter	54.00
⅝ to ½-in., inclusive	54.00

NUTS

Reg. & Heavy Square Nuts:	
All sizes	58.0
Square Nuts, Reg. & Heavy, Hot Galvanized:	
All sizes	44.0
Hex Nuts, Reg. & Heavy, Hot Pressed:	
¾ in. and smaller	61.5
⅞ in. to 1 in., incl.	57.5
1⅛ in. to 1½ in., incl.	62.5
1⅝ in. and larger	56.0
Hex Nuts, Reg. & Heavy, Cold Punched:	
¾ in. and smaller	61.5
⅞ in. to 1½ in., incl.	57.5
1⅝ in. and larger	56.0
Hex Nuts, All Types, Hot Galvanized:	
¾ in. and smaller	48.0
⅞ in. to 1 in., incl.	44.0
1⅛ in. to 1½ in., incl.	49.0
Hex Nuts, Semifinished, Heavy (Incl. Slotted):	
¾ in. and smaller	61.5
⅞ in. to 1½ in., incl.	57.5
1⅝ in. and larger	56.0
Hex Nuts, Finished (Incl. Slotted and Castellated):	
1 in. and smaller	64.00
1⅛ in. to 1½ in., incl.	60.5
1⅝ in. and larger	56.0

Semifinished Hex Nuts, Reg. (Including Slotted):

⅝ in. and smaller	61.5
¾ in. to 1-in., incl.	64.0
1⅛ in. to 1½ in., incl.	60.5
1⅝ in. and larger	56.0

CAP AND SET SCREWS

(Base discounts, packages, per cent off list, f.o.b. mill)

Hex Head Cap Screws, Coarse or Fine Thread, Bright:

6 in. and shorter:	
⅝ in. and smaller	44.0
¾, ⅞ and 1 in. diam.	27.0
Longer than 6 in.:	
⅝ in. and smaller	14.0
¾, ⅞ and 1 in. diam.	0.5

High Carbon, Heat Treated:

6 in. and shorter:	
⅝ in. and smaller	31.0
¾, ⅞ and 1 in. diam.	9.0
Longer than 6 in.:	
⅝ in. and smaller	+6
¾, ⅞ and 1 in. diam.	+24
Flat Head Cap Screws:	
¾ in. and smaller	+65.0
Set Screws, Square Head, Cup Point, Coarse Thread:	
Through 1 in. diam.:	
6 in. and shorter	11
Longer than 6 in.	+10

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.
Structural ½-in., larger 11.50
7/8-in. under List less 23%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	24.55	23.54
1¼	13	....	29.07	23.36
1½	13	27.45	32.14	25.83
1¾	13	32.43	37.97	30.51
2	13	36.34	42.56	34.20
2¼	13	40.93	47.94	38.52
2½	12	44.42	52.03	41.81
2½	12	48.94	57.31	46.05
2¾	12	52.99	62.05	49.88
3	12	56.51	66.18	53.19

RAILWAY MATERIALS

RAILS	Standard No. 1	Standard No. 2	Tee Rails All	Tee Rails 60 lb Under
Bessemer,Pa. U5	5.275	5.175	5.225	6.25
Ensley,Ala. T2	5.275	5.175	....	6.25
Fairfield,Ala. T2	....	....	....	6.25
Huntington,W.Va. C15	....	....	....	6.25
Gary,Ind. U5	5.275	5.175	5.225	...
IndianaHarbor,Ind. I-2	5.275	5.175	5.225	...
Johnstown,Pa. B2	....	....	...(16)	6.25
Lackawanna,N.Y. B2	5.275	5.175	....	6.25
Minnequa,Colo. C10	5.275	5.175	....	6.75
Steelton,Pa. B2	5.275	5.175	....	...
Williamsport,Pa. S19	....	....	....	6.15

TIE PLATES

Fairfield,Ala. T2	6.275
Gary,Ind. U5	6.275
Ind.Harbor,Ind. I-2	6.275
Lackawanna,N.Y. B2	6.275
Minnequa,Colo. C10	6.275
Seattle B3	6.425
Steelton,Pa. B2	6.275
Torrance,Calif. C11	6.425

JOINT BARS

Bessemer,Pa. U5	6.60
Fairfield,Ala. T2	6.60
Ind.Harbor,Ind. I-2	6.60
Joliet,Ill. U5	6.60
Lackawanna,N.Y. B2	6.60
Minnequa,Colo. C10	6.60
Steelton,Pa. B2	6.60

AXLES

Ind.Harbor,Ind. S13	8.35
Johnstown,Pa. B2	8.35

TRACK BOLTS, Untreated

Cleveland R2	13.85
KansasCity,Mo. S5	13.85
Lebanon,Pa. B2	13.85
Minnequa,Colo. C10	13.85
Pittsburgh P14	13.10
Seattle B3	14.35

SCREW SPIKES

Lebanon,Pa. B2	13.60
Pittsburgh P14	12.85

STANDARD TRACK SPIKES

Fairfield,Ala. T2	9.225
Ind.Harbor,Ind. I-2, Y1	9.225
KansasCity,Mo. S5	9.225
Lebanon,Pa. B2	9.225
Minnequa,Colo. C10	9.225
Pittsburgh J5	9.225
Seattle B3	9.725
S.Chicago,Ill. R2	9.225
Struthers,O. Y1	9.225
Youngstown R2	9.225

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1⅛ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in.; 6.23c; 1 15/16 to 8 in., inclusive, 6.60c.
(6) Chicago or Birm. base.
(7) Chicago base 2 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(20) Plus 1c per 100 lb.
(21) New Haven, Conn. base.
(22) Deld. San Francisco Bay area.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.685c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝-in.; 7.30c, for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 14 Ga. & lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.685c.
(43) 9-14½ Ga.
(44) To fabricators.
(48) 6-7 Ga.
(49) 3½-in. and smaller rounds; 8.65c, over 3½-in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+5.25	+21.75	1.25	+16.5	3.75	+14	5.25	+12.5	5.25	+12.5	5	+12.75	7.5	+10.25
Ambridge, Pa. N2	+5.25	....	1.25	....	3.75	....	5.25	....	5.25	....	5	....	7.5	....
Lorain, O. N3	+5.25	+21.75	1.25	+16.5	3.75	+14	5.25	+12.5	5.25	+12.5	5	+12.75	7.5	+10.25
Youngstown Y1	+5.25	+21.75	1.25	+16.5	3.75	+14	5.25	+12.5	5.25	+12.5	5	+12.75	7.5	+10.25

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+5.25	+21.75	1.25	+16.5	3.75	+14	5.25	+12.5	5.25	+12.5	5	+12.75	7.5	+10.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Alton, Ill. L1	....	....	....	....	....	....	7.25	+10	10.25	+6	13.75	+1.5	16.25	+0.25
Benwood, W. Va. W10	6.5	+22	+4.75	+30.25	+14.75	+39.25	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Butler, Pa. F6	7.5	+21	+3	+28.5	+12.5	+37	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Fairless, Pa. N3	....	....	....	....	....	....	7.25	+10	10.25	+6	13.75	+1.5	16.25	+0.25
Fontana, Calif. K1	....	....	....	....	....	....	3.75	+21	+0.75	+17	2.75	+12.5	5.25	+11.25
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	8.25	+9	11.25	+5	14.75	+0.5	17.25	+0.75
Lorain, O. N3	....	....	....	....	....	....	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Sharon, Pa. S4	6.5	+22	+4	+29.5	+13.5	+38	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Sparrows Pt., Md. B2	5.5	+23	+0.5	+30.5	+14.5	+39	7.25	+10	10.25	+6	13.75	+1.5	16.25	+0.25
Wheatland, Pa. W9	7.5	+21	+3	+28.5	+12.5	+37	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75
Youngstown R2, Y1	....	....	....	....	....	....	9.25	+8	12.25	+4	15.75	0.5	18.25	1.75

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	....	....	....	....
Alton, Ill. L1	16.75	0.75	17.25	1.25	18.75	1.5	18.75	1.5	....	....	....	....
Benwood, W. Va. W10	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	10.25	+7.5	10.25	+7.5
Etna, Pa. N2	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	10.25	+7.5	10.25	+7.5
Fairless, Pa. N3	16.75	0.75	17.25	1.25	18.75	1.5	18.75	1.5	8.25	+9.5	8.25	+9.5
Fontana, Calif. K1	5.75	+10.25	6.25	+9.75	7.75	+9.5	7.75	+9.5	+2.75	+20.5	+2.75	+20.5
Indiana Harbor, Ind. Y1	17.75	1.75	18.25	2.25	19.75	2.5	19.25	2.5	9.25	+8.5	9.25	+8.5
Lorain, O. N3	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	....	....	....	....
Sharon, Pa. M6	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	....	....	....	....
Sparrows Pt., Md. B2	16.75	0.75	17.25	1.25	18.75	1.5	18.75	1.5	8.25	+9.5	8.25	+9.5
Wheatland, Pa. W9	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	10.25	+7.5	10.25	+7.5
Youngstown R2, Y1	18.75	2.75	19.25	3.25	20.75	3.5	20.75	3.5	10.25	+7.5	10.25	+7.5

*Galvanized pipe discounts based on current price of zinc (11.50c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling— Ingot	Slabs	Forging Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	21.25	26.00	....	34.50	....	40.50	42.50	46.75	43.25
202	22.75	29.00	35.00	37.50	39.25	41.25	43.25	47.25	47.25
301	22.25	27.00	35.75	35.75	40.25	42.50	44.50	49.25	45.75
302	24.25	30.25	36.50	39.00	41.00	43.25	45.50	50.00	50.00
302B	24.50	31.50	39.25	44.00	43.25	45.50	47.50	54.75	54.75
303	....	30.75	39.50	....	44.00	46.25	48.00	54.50	54.50
304	26.00	32.00	39.00	42.50	43.75	46.00	48.75	53.25	53.25
304L	....	....	46.50	49.50	51.25	53.50	56.25	60.75	60.75
305	27.50	35.25	40.75	45.75	43.75	46.00	49.25	56.50	56.50
308	29.50	36.75	45.50	48.25	50.75	53.50	58.00	60.50	60.50
309	38.25	47.50	55.50	62.00	61.25	64.50	68.25	77.50	77.50
310	47.75	59.25	75.00	81.00	83.25	87.50	89.25	93.00	93.00
314	....	....	....	....	83.25	....	80.25	....	100.50
316	38.25	47.50	59.75	66.50	66.75	70.25	73.75	78.25	78.25
316L	....	....	67.25	73.00	74.25	77.75	81.25	85.75	85.75
317	46.25	57.75	73.75	84.75	83.00	87.25	90.00	97.00	97.00
321	31.00	38.50	45.25	51.50	50.50	53.25	57.50	63.00	63.00
18-8 CbTa	35.50	44.75	53.50	61.00	59.25	62.25	67.00	76.25	76.25
403	....	....	30.75	....	34.50	36.25	38.75	46.50	46.50
405	18.75	24.50	28.50	34.50	32.50	34.00	36.00	45.00	45.00
410	16.00	20.75	27.25	29.75	31.00	32.50	33.75	38.75	38.75
416	....	....	27.75	....	31.50	33.00	34.75	46.50	46.50
420	....	32.25	33.00	40.25	37.75	39.75	43.50	59.50	59.50
430	16.25	21.00	27.75	30.75	31.50	33.00	34.50	39.25	39.25
430F	....	....	28.25	....	32.00	33.50	35.25	49.75	49.75
431	....	27.75	36.25	....	40.50	42.50	44.25	53.75	53.75
446	....	....	37.75	56.75	42.50	44.75	46.00	67.25	67.25

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Div., H. K. Porter Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U.S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Elwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McInnes Steel Co.; McLouth Steel Corp.; Metal Forming Corp.; National-Standard Co.; National Tube Div., U.S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Stainless Steel Div., Jones & Laughlin Steel Corp.; Superior Steel Corp.; Superior Tube Co.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

Stainless	Plates—Carbon Base 5%	10%	15%	20%	Sheets Carbon Base 20%
302	....	....	....	....	35.50
304	33.15	36.20	40.30	44.50	37.75
304-L	35.40	38.80	43.15	47.65	....
316	38.35	41.60	45.90	50.15	55.50
316-L	43.55	47.60	52.70	57.85	....
316-Cb	43.85	48.10	53.40	58.75	....
321	34.90	37.95	42.10	46.40	44.75
347	37.05	41.25	46.45	51.70	54.25
405	27.55	29.20	33.15	37.05	....
410	27.00	28.70	32.65	36.55	....
430	27.00	28.70	32.65	36.55	....
Inconel	47.28	57.90	68.50	79.20	....
Nickel	40.00	50.30	60.65	71.05	....
Nickel, Low Carbon	40.30	50.95	61.65	72.50	....
Monel	41.70	51.90	62.15	72.40	....
Copper*	....	....	....	....	46.00

	Strip, Carbon Base —Cold Rolled— 10%	Both Sides
Copper*	33.00	39.85

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.290	Cr Hot Work	0.45-0.495
Extra Carbon	0.345	W-Cr Hot Work	0.43-0.475
Special Carbon	0.41-0.45	V-Cr Hot Work	0.460
Oil Hardening	0.450	Hi-Carbon-Cr	0.830

Grade by Analysis (%) W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	....	4.170
18.25	4.25	1	4.75	....	2.385
18	4	2	9	....	2.755
18	4	2	....	....	1.845
18	4	1	....	....	1.680
9	3.5	..	....	....	1.275
13.5	4	3	....	....	1.945
13.75	3.75	2	5	....	2.325
6.4	4.5	1.9	....	5	1.185
6	4	3	....	6	1.430
1.5	4	1	....	8.5	1.040

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, F2, J3, L3, M14, S8, U4, V2, and V3.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal tax.

Birmingham District	Basic	No. 2 Foundry	Malle-able	Besse-mer
AlabamaCity,Ala. R2	58.50	59.00	....	....
Birmingham R2	58.50	59.00‡	....	....
Birmingham U6	....	59.00‡	63.00	....
Woodward,Ala. W15	58.50**	59.00‡	63.00	....
Cincinnati, deld.	....	66.70	....	....
Buffalo District				
Buffalo H1, R2	64.50	65.00	65.50	66.00
Tonawanda,N.Y. W12	64.50	65.00	65.50	66.00
N.Tonawanda,N.Y. T9	....	65.00	65.50	66.00
Boston, deld.	75.79	76.29	76.79	....
Rochester,N.Y., deld.	67.52	68.02	68.52	....
Syracuse,N.Y., deld.	68.62	69.12	69.62	....
Chicago District				
Chicago I-3	64.50	65.00	65.00	65.50
S.Chicago,Ill. R2	64.50	....	65.00	....
S.Chicago,Ill. Y1	64.50	65.00	65.00	....
S.Chicago,Ill. W14	64.50	....	65.00	65.50
Milwaukee, deld.	66.96	67.46	67.46	67.96
Muskegon,Mich., deld.	....	78.83	78.83	....
Cleveland District				
Cleveland R2, A7	64.50	65.00	65.00	65.50
Akron,O., deld.	67.62	68.12	68.12	68.62
Mid-Atlantic District				
Birdsboro,Pa. B10	66.50	67.00	67.50	68.00
Chester,Pa. P4	66.50	67.00	67.50	....
Swedeland,Pa. A3	66.50	67.00	67.50	68.00
New York, deld.	....	73.20	73.70	....
Newark,N.J., deld.	70.52	71.02	71.52	72.02
Philadelphia, deld.	68.38	68.88	69.38	69.88
Troy,N.Y. R2	66.50	67.00	67.50	68.00
Pittsburgh District				
NevilleIsland,Pa. P6	64.50	65.00	65.00	65.50
Pittsburgh (N&S sides), Aliquippa, deld.	....	66.45	66.45	66.98
McKeesRocks,Pa., deld.	....	66.10	66.10	66.63
Lawrenceville, Homestead, Wilmerding,Monaca,Pa., deld.	....	66.76	66.76	67.29
Verona,Trafford,Pa., deld.	66.79	67.32	67.32	67.85
Brackenridge,Pa., deld.	67.10	67.60	67.60	68.13
Midland,Pa. C18	64.50	....	....	....

Youngstown District	Basic	No. 2 Foundry	Malle-able	Besse-mer
Hubbard,O. Y1	....	....	65.00	....
Sharpsville,Pa. S6	64.50	....	65.00	65.50
Youngstown Y1	....	....	65.00	65.50
Mansfield,O., deld.	69.40	....	69.90	70.40
Duluth I-3	64.50	65.00	65.00	65.50
Erie,Pa. I-3	64.50	65.00	65.00	65.50
Everett,Mass. E1	66.00	66.50	67.00	....
Fontana,Calif. K1	72.50	73.00	....	....
Geneva,Utah C11	64.50	65.00	....	....
GraniteCity,Ill. G4	66.40	66.90	67.40	....
Ironton,Utah C11	64.50	65.00	....	....
Minnequa,Colo. C10	66.50	67.00	67.50	....
Rockwood,Tenn. T3	....	59.00‡	63.00	....
Toledo,O. I-3	64.50	65.00	65.00	65.50
Cincinnati, deld.	71.04	71.54	....	....

**Phos. 0.70-0.90%; Phos. 0.30-0.60%, $59.50.
‡Phos. 0.70-0.90%; Phos. 0.30-0.50%, $60.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

Nickel: Under 0.50% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1 for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 11.50%; starting with silicon over 11.50% add $1.50 per ton for each 0.50% silicon or portion thereof up to 14%; add $1 for each 0.50% Mn over 1%)

Jackson,O. I-3, J1	77.25
Buffalo H1	78.50

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity,Ky. P15	$105.50
NiagaraFalls,N.Y. P15	105.50
Keokuk,Iowa Open-hearth & Fdry, $9 freight allowed K2	103.50
Keokuk,Iowa O.H. & Fdry, 12½ lb piglets, 16% Si, max frgt allowed up to $9, K2	106.50

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$78.50
Rockwood,Tenn. T3 (Phos. 0.035% max)	78.50
Troy,N.Y. R2 (Phos. 0.035% max)	72.50
Philadelphia, deld.	80.26
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	69.50
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	69.50
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	69.50
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	69.50

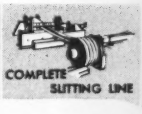
Warehouse Steel Products

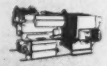
Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, Spokane, San Francisco, 10 cents; Atlanta, Houston, Seattle no charge.

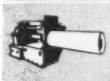
	SHEETS				STRIP	BARS			Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Rounds	C.F. Rds.‡	H.R. Alloy 4140††[3]		Carbon	Floor
Atlanta	8.17§	9.37§	9.83§	....	8.21	8.45	10.23	....	8.59	8.55	10.51
Baltimore	7.88	8.98	9.31	....	8.36	8.53	9.13[3]	14.68	8.75	8.26	9.76
Birmingham	7.80	9.00	9.52	....	7.82	8.07	10.12	....	8.20	8.16	10.31
Boston	8.84	9.88	9.24	60.42	8.89	9.07	....	14.69	9.10	9.18	10.68
Buffalo	7.85	9.00	10.68	....	8.05	8.25	8.70	14.50	8.50	8.50	10.05
Chattanooga	7.99	9.24	9.10	....	8.00	8.24	10.04	....	8.44	8.40	10.26
Chicago	7.78	9.00	9.80	53.25	7.82	8.07	8.35	14.15	8.20	8.16	9.49
Cincinnati	7.94	9.05	9.65	50.00	8.14	8.38	8.84	14.46	8.74	8.52	9.78
Cleveland	7.78	8.98	9.55	53.43	7.92	8.16	8.60	14.24	8.57	8.39	9.72
Denver	9.70	11.30	12.49	....	9.80	9.95	10.65	18.89	9.80	9.70	11.40
Detroit	8.03	9.25	10.00	59.50	8.17	8.37	8.70	14.41	8.74	8.51	9.74
Erie, Pa.	7.85	9.00	9.60[10]	....	7.95	8.20	8.70[10]	....	8.50	8.35	9.75
Houston	8.80	9.75	10.99	....	7.75	8.05	9.15	15.00	8.00	8.80	10.30
Jackson, Miss.	8.09	9.34	9.79	....	8.16	8.41	10.23	....	8.54	8.50	10.34
Los Angeles	9.10	12.30	11.25	57.45	9.15	9.20	12.10	15.50	9.15	9.65	11.80
Milwaukee	7.93	9.13	9.93	....	7.95	8.20	8.58	14.28	8.41	8.29	9.62
Moline, Ill.	8.13	9.35	10.05	....	8.17	8.42	8.70	....	8.55	8.51	...
New York	8.45	9.66	10.21	60.20	8.90	9.01	....	14.59	8.91	9.01	10.31
Norfolk, Va.	8.05	...	....	....	8.55	8.60	10.80	....	8.95	8.45	9.95
Philadelphia	8.15	9.07	10.29	50.69	8.82	8.71	9.31	14.51	8.70	8.68	9.70
Pittsburgh	7.78	8.99	10.00	50.00	7.92	8.07	8.60	14.15	8.20	8.16	9.49
Portland, Oreg.	9.20	11.20	11.60	55.20	11.05‡‡	9.35	13.80	14.60	9.35	9.00	12.20
Richmond, Va.	8.00	...	10.14	....	8.55	8.40	10.00	....	8.95	8.40	9.90
St. Louis	8.14	9.34	10.16	73.36	8.19	8.43	8.96	14.51	8.67	8.52	9.86
St. Paul	8.39	9.59	10.26	....	8.43	8.68	9.21	....	8.94	8.90	10.10
San Francisco	9.05	10.95	10.90	53.45	9.05	9.15	12.40	15.60	9.15	9.30	11.55
Seattle	9.55	10.70	11.65	55.20	9.55	9.50	13.40	15.85	9.35	9.30	11.70
Spokane, Wash.	9.55	10.70	11.65	....	9.55	9.50	13.40	16.60	9.35	9.30	11.70
Washington	8.48	9.58	....	....	9.06	9.13	9.73	....	9.35	8.86	10.36

*Prices do not include gage extras; †prices include gage and coating extras (based on 12.50c zinc at Los Angeles and 13.50c at other points), except in Birmingham (coating extra excluded); ‡includes 35-cent bar quality extras; §42 in. and under; **⅛-in. and heavier; ††as annealed; ‡‡over 4 in.; §§over 3 in.

Base quantities, 2000 to 4999 lb except as noted; cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb; [3]—400 to 999 lb; [5]—1000 to 1999 lb; [8]—2000 to 3999 lb; [10]—2000 lb and over.

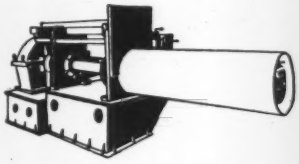






Removable Mandrel

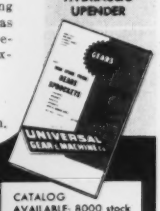
RECOILERS



Because many slitting lines are required to use different inside coil diameters UNIVERSAL offers a removable type mandrel that can be exchanged for another size. The diameters of the mandrels range from 10 to 30 inches. Both include the mandrel and its main shaft and are removable, thus making it possible to rewind heavier coils on the larger diameter mandrels since the main shaft is proportionately larger. Substituting mandrels takes only about 15 minutes as it is only necessary to remove a retainer plate and a coupling on the expanding cylinder rod.

Machinery Catalog Available

A few territories open for representation.



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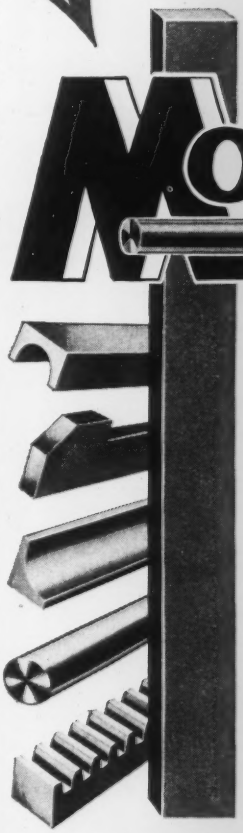

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Detroit, Mich. New York, N. Y. Syracuse, N. Y. Cincinnati, O.
Cleveland, O. Los Angeles, Calif.

SE

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beach Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $135; Salina, Pa., $140; Niles, O., $138; Cutler, Utah, $165.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Pa., New Savage, Md., St. Louis, $175; Stevens Pottery, Ga., $185; Cutler, Utah, $233.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, O., Hawstone, Pa., $150; Warren, Niles, Windham, O., Hays, Latrobe, Morrisville, Pa., $155; E. Chicago, Ind., Joliet, Rockdale, Ill., $160; Lehigh, Utah, $175; Los Angeles, $180.

Super-Duty: Hays, Sproul, Hawstone, Pa., Niles, Warren, Windham, O., Leslie, Md., Athens, Tex., $157; Morrisville, Latrobe, Pa., $160; E. Chicago, Ind., $167; Curtner, Calif., $182.

Semisilica Brick (per 1000)

Clearfield, Pa., $145; Woodbridge, N. J., $135; Philadelphia, $130.

Ladle Brick (per 1000)

Dry Pressed: Aisey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, O., $100; Clearfield, Pa., Portsmouth, O., $102.

High-Alumina Brick (per 1000)

50 Per Cent: St. Louis, Mexico, Vandalia, Mo., $235; Danville, Ill., $238; Philadelphia, Clearfield, Pa., $230; Orviston, Pa., $245.

60 Per Cent: St. Louis, Mexico, Vandalia, Mo., $295; Danville, Ill., $298; Philadelphia, Clearfield, Orviston, Pa., $305.

70 Per Cent: St. Louis, Mexico, Vandalia, Mo., $335; Danville, Ill., $338; Philadelphia, Clearfield, Orviston, Pa., $345.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $188.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, O., Gibsonburg, Narlo, O., $16; Thornton, McCook, Ill., $16.35; Dolly Siding, Bonne Terre, Mo., $15.

Magnesite (per net ton)

Domestic, dead-burned, bulk ½-in. grains with fines: Chewelah, Wash., Luning, Nev., $46; ⅜-in. grains with fines: Baltimore, $72.40.

Fluorspar

Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-$41; 70%, $36-$40; 60%, $33-$36.50. Imported, net tons, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $34-$35; Mexican, all-rail, duty paid, $27-$27.75; barge, Brownsville, Tex., $27.75-$29.

Metal Powder

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge Iron, Swedish: Deld. east of Mississippi river, ocean bags 23,000 lb and over. F.o.b. Riverton or Camden, N.J., west of Mississippi river	10.50 / 9.50
Sponge Iron, domestic, 98 + %Fe: Deld. east of Mississippi river, 23,000 lb and over. F.o.b. Riverton, N.J., west of Mississippi river	10.50 / 9.50
Sponge Iron, Canadian: F.o.b. shipping point	9.50
Electrolytic Iron: Melting stock, 99.9% Fe, irregular fragments of ⅛ in. x 1.3 in.	26.00
Annealed, 99.5% Fe	36.50
Unannealed (99+ % Fe)	34.00
Unannealed (99+ % Fe) (minus 325 mesh)	59.00
Powder Flakes (minus 16, plus 100 mesh)	29.00
Carbonyl Iron: 98.1-99.9%, 3 to 20 microns, depending on grade, 99.00-290.00, in standard 200-lb containers; all minus 200 mesh.	
Aluminum: Atomized, 500 lb drum, frght allowed Carlots / Ton lots	38.20 / 40.20
Antimony, 500 lb lots	32.00*
Brass, 5000-lb lots	34.80-43.20†
Bronze, 5000-lb lots	52.80-57.20†
Copper: Electrolytic	14.25*
Reduced	14.25*
Lead	7.50*
Manganese: Minus 35 mesh / Minus 100 mesh / Minus 200 mesh	64.00 / 70.00 / 75.00
Nickel, unannealed	$1.065
Nickel-Silver, 5000-lb lots	53.30-57.60†
Phosphor-Copper, 5000-lb lots	62.00
Copper (atomized) 5000-lb lots	44.50-52.00‡
Silicon	47.50
Solder	7.00*
Stainless Steel, 304	$1.08
Stainless Steel, 316	$1.44
Tin	14.50*
Zinc, 5000-lb lots	19.75-33.00‡
Tungsten: Dollars Melting grade, 99% 60 to 2000 mesh: 1000 lb and over / Less than 1000 lb	4.00 / 4.15
Chromium, electrolytic 99.8% Cr min metallic basis	5.00

*Plus cost of metal. †Depending on composition. ‡Depending on mesh. §70% Cu, 20% Zn, 10% Ni. **64% Cu, 18% Zn, 18% Ni.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE

Diam.	Length	Per 100 lb
2	24	$57.75
2½	30	37.25
3	40	35.25
4	40	33.25
5½	40	33.00
6	60	30.00
7	60	26.75
8, 9, 10	60	26.50
12	72	25.50
14	60	25.50
16	72	24.50
17	60	25.50
18	72	24.50
20	72	24.00
24	84	24.75

CARBON

8	60	13.30
10	60	13.00
12	60	12.95
14	60	12.85
14	72	11.95
17	60	11.85
17	72	11.40
20	84	11.40
20	90	11.00
24	72, 84	11.25
24	96	10.95
30	84	11.05
40, 35	110	10.70
40	100	10.70

Imported Steel

(Base per 100 lb, landed, duty paid, based on current ocean rates. Any increase in these rates is for buyer's account. Source of shipment: Western continental European countries)

	North Atlantic	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305	$7.15	$7.15	$7.15	$7.40
Bar Size Angles	6.95	6.95	6.95	7.05
Structural Angles	7.10	7.10	7.10	7.30
I-Beams	7.50	7.50	7.50	7.75
Channels	7.55	7.55	7.55	7.80
Plates (basic bessemer)	9.00	9.00	9.00	9.30
Sheets, H.R.	8.55	8.55	8.55	8.85
Sheets, C.R. (drawing quality)	8.95	8.95	8.95	9.35
Furring Channels, C.R., 1000 ft, ¾ x 0.30 lb per ft	27.17	27.17	27.17	27.64
Barbed Wire (†)	6.80	6.80	6.80	7.25
Merchant Bars	6.95	6.95	6.95	7.30
Hot-Rolled Bands	7.15	7.15	7.15	7.55
Wire Rods, Thomas Commercial No. 5	6.38	6.38	6.38	6.78
Wire Rods, O-H Cold Heading Quality No. 5	6.72	6.72	6.72	7.12
Bright Common Wire Nails (‡)	8.40	8.40	8.40	8.57

†Per 82-lb, net, reel. ‡Per 100-lb kegs, 20d nails and heavier.

Ores

Lake Superior Iron Ore

(Prices effective for the 1957 shipping season, gross tons, 51.50% iron natural, rail of vessel, lower lake ports.)

Mesabi bessemer	$11.60
Mesabi nonbessemer	11.45
Old range bessemer	11.85
Old range nonbessemer	11.70
Open-hearth lump	12.70
High phos.	11.45

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 30, 1957, and increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

New Jersey, foundry and basic 62-64% concentrates	25.00-27.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	27.00-27.50
N. African hematite (spot)	nom.
Brazilian iron ore, 68-69%	35.00-36.00

Tungsten Ore

Net ton unit, before duty

Foreign, wolframite, good commercial quality	$23.00-24.00
Domestic, concentrates, mine	55.00

Manganese Ore

Mn 46-48%, Indian (export tax included), $1.60-1.70 per long ton unit, c.i.f. U.S. ports, duty for buyer's account; other than Indian, $1.45-1.50; contracts by negotiation.

Chrome Ore

Gross ton f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian

48% 3:1	$55.00-58.00
48% 2.8:1	52.00-55.00
48% no ratio	46.00-48.00

South African Transvaal

48% no ratio	$40.00-41.00
44% no ratio	30.00-31.00

Turkish

48% 3:1	$59.00-62.00

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulphide concentrate, per lb of Mo content, mines, unpacked	$1.18

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard	
55-60%	$3.10-3.60
60-65%	3.60-3.80

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace	$14.75-15.75
Connellsville, foundry	17.50-18.50

Oven Foundry Coke

Birmingham, ovens	$28.85
Cincinnati, deld.	33.78
Buffalo, ovens	30.50
Camden, N. J., ovens	29.50
Detroit, ovens	30.50
Pontiac, deld.	32.25
Saginaw, deld.	33.83
Erie, Pa., ovens	30.50
Everett, Mass., ovens New England, deld.	31.55*
Indianapolis, ovens	29.75
Ironton, O., ovens	29.00
Cincinnati, deld.	29.27
Kearny, N. J., ovens	29.75
Milwaukee, ovens	30.50
Painesville, O., ovens	30.50
Cleveland, deld.	32.69
Philadelphia, ovens	29.50
St. Louis, ovens	31.50
Neville Island (Pittsburgh), Pa., ovens	29.25
St. Paul, ovens	29.75
Chicago, deld.	33.14
Swedeland, Pa., ovens	29.50
Terre Haute, Ind., ovens	29.75

*Or within $4.80 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	36.00
Toluene, one deg.	32.00-34.00
Industrial xylene	32.00-35.00

Per ton, bulk, ovens

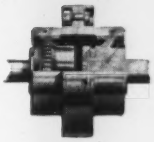
Ammonium sulfate	$32.00

Cents per pound, producing point

Phenol: Grade 1, 15.00; Grade 2-3, 14.50; Grade 4, 16.50; Grade 5, 15.25.

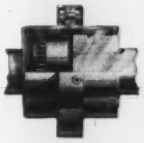
AJAX Flexible couplings

D100-12°



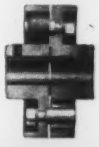
Ajax Series D-100 Dihedral Couplings handle shaft misalignment, — offset, angular and end float up to 12°. Patented tooth design permits far less tooth clearance and provides more tooth area in contact under misalignment than with any other shaped tooth. No end-of-tooth wear, even under maximum misalignment.

D3000-3°



Ajax Series D-3000 Dihedral Couplings handle shaft misalignment up to 3°, — yet cost no more than ordinary gear type couplings that have far less misalignment capacity. Specially designed gear teeth distribute load over center of teeth, point of greatest strength. Johns-Manville "Clipper" Seals keep lubricant in and foreign matter out.

RUBBER-BRONZE BUSHED



Ajax Rubber-Bronze Bushed Couplings are built in a wide range of sizes and capacities with standard couplings made of forged steel or cast semi-steel. Flanges can be machined from aluminum, bronze and other metals, and can be chrome, cadmium or silver plated for protection from adverse atmospheric conditions. *Write for catalogs today.*

AJAX FLEXIBLE COUPLING CO. INC.
WESTFIELD, NEW YORK

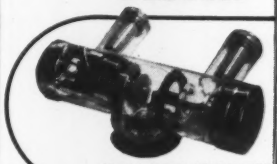
NICE BEARINGS Help Advance X-RAY DESIGN

New demands for X-ray tube capacity have been answered by Machlett Laboratories, Inc., Springdale, Connecticut. The Machlett DYNAMAX design incorporates a rotating anode mounted on highly specialized ball bearings made by NICE BALL BEARING COMPANY.

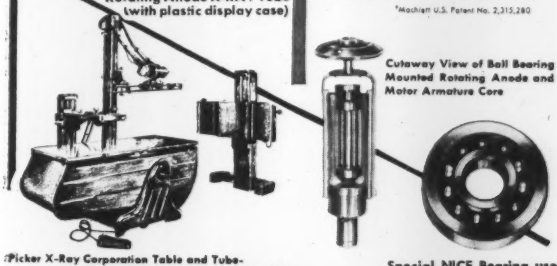
The success of the rotating anode principle is largely due to the development of suitable bearings. The NICE Bearings used by Machlett are made to exacting tolerances from special heat resisting steel and silver lubricated for use in high vacuum*. They have proven to be the complete answer to all requirement problems.

Now Available! New NICE Cat. No. 190

*Machlett U.S. Patent No. 2,315,280



Machlett DYNAMAX "25" Rotating Anode X-RAY Tube (with plastic display case)



Cutaway View of Ball Bearing Mounted Rotating Anode and Motor Armature Core

Picker X-Ray Corporation Table and Tube-stand incorporating Machlett DYNAMAX

Special NICE Bearing used at bottom of Rotor. A similar Special Bearing is mounted at top of Rotor.

NICE

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A Specialist helps you select the right slings and wire rope for your jobs

You can depend on your Yellow Strand distributor for recommending the right size and type of wire rope and slings — and for ample stocks on hand.

He knows exactly the rope to best fit your equipment for greatest wire rope service. And he maintains stocks of standard strength Yellow Strand, Yellow Strand "POWERSTEEL," Yellow Strand Flattened Strand and Braided Safety Slings, to promptly supply your needs.

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Ferroalloys

MANGANESE ALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton, Pa. 21-23% Mn, $105; 19-21% Mn, 1-3% Si, $102.50; 16-19% Mn, $100.50.

Standard Ferromanganese: (Mn 74-76%, C 7% approx). Base price per net ton; $255, Johnstown, Duquesne, Sheridan, Pa., Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74% respectively.

(Mn 79-81%). Lump $263 per net ton, f.o.b. Anaconda or Great Falls, Mont. Add $2.60 for each 1% above 81%; subtract $2.60 for each 1% below 79%, fractions in proportion to nearest 0.1%.

High-Grade Low-Carbon Ferromanganese: (Mn 85-90%). Carload, lump, bulk, max 0.07% C, 35.1c lb of contained Mn, carload packed 36.4c, ton lots 37.9c, less ton 39.1c. Delivered. Deduct 1.5c for max 0.15% C grade from above prices, 3c for max 0.03% C, 3.5c for max 0.50% C, and 6.5c for max 75% C—max 7% Si. **Special Grade:** (Mn 90% min, C 0.07% max, P 0.06% max). Add 2.05c to the above prices. Spot, add 0.25c.

Medium-Carbon Ferromanganese: (Mn 80-85%, C 1.25-1.5%, Si 1.5% max). Carload, lump, bulk, 25.5c per lb of contained Mn, packed, carload 26.8c, ton lot 28.4c, less ton 29.6c. Delivered. Spot, add 0.25c.

Manganese Metal: 2" x D (Mn 95.5% min, Fe 2% max, Si 1% max, C 0.2% max). Carload, lump, bulk 45c per lb of metal; packed, 45.75c; ton lot 47.25c; less ton lot 49.25c. Delivered. Spot, add 2c.

Electrolytic Manganese Metal: Min carload, 34c; 2000 lb to min carload, 36c; 500 lb to 1999 lb, 38c; 50 lb cans, add 0.5c per lb. Premium for hydrogen-removed metal, 0.75c per lb. Prices are f.o.b. cars, Knoxville, Tenn., freight allowed to St. Louis or any point east of Mississippi; or f.o.b. Marietta, O., freight allowed.

Silicomanganese: (Mn 65-68%). Contract, lump, bulk 1.50% C grade, 18-20% Si, 12.8c per lb of alloy. Packed, c.l. 14c, ton 14.45c, less ton 15.45c, f.o.b. Alloy, W. Va., Ashtabula, O., Marietta, O., Sheffield, Ala., Portland, Oreg. For 2% C grade, Si 15-17%, deduct 0.2c from above prices. For 3% C grade Si 12-14.5%, deduct 0.4c from above prices. Spot, add 0.25c.

TITANIUM ALLOYS

Ferrotitanium, Low-Carbon: (Ti 20-25%, Al 3.5% max, Si 4% max, C 0.10% max). Contract, ton lot, 2" x D, $1.50 per lb of contained Ti; less ton $1.55. (Ti 38-43%, Al 8% max, Si 4% max, C 0.10% max). Ton lot $1.35, less ton $1.37, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis. Spot, add 5c.

Ferrotitanium, High-Carbon: (Ti 15-18%, C 6-8%). Contract $200 per ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi river and north of Baltimore and St. Louis.

Ferrotitanium Medium-Carbon: (Ti 17-21%, C 2-4.5%). Contract $225 per ton, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

CHROMINUM ALLOYS

High-Carbon Ferrochrome: Contract, c.l. lump, bulk, 27.75c per lb of contained Cr; c.l. packed 29.3c, ton lot 31.05c; less ton 32.45c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome: (Cr 67-71%). Contract carload, lump, bulk, C 0.025% max (Simplex) 34.75c per lb contained Cr, 0.02% max 41.5c, 0.03% max 41c, 0.06% max 39.5c, 0.1% max 39c, 0.15% max 38.75c, 0.2% max 38.5c, 0.5% max 38.25c, 1.0% max 37.5c, 1.5% max 37.35c, 2.0% max 37.25c. Ton lot, add 3.4c, less ton add 5.1c. Carload packed add 1.75c. Delivered. Spot, add 0.25c.

Foundry Ferrochrome, High-Carbon: (Cr 62-66%, C 5-7%, Si 7-10%). Contract, c.l., 2 in. x D, bulk 29.05c per lb contained Cr. Packed, c.l. 30.65c, ton 32.45c, less ton 33.95c. Delivered. Spot, add 0.25c.

Foundry Ferrosilicon Chrome: (Cr 50-54%, Si 28-32%, C 1.25% max). Contract, carload, packed, 8M x D, 20.85c, per lb of alloy, ton lot 22.10c; less ton lots 23.3c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome-Silicon: (Cr 39-41%, Si 42-49%, C 0.05% max). Contract, carload, lump, 4" x down and 2" x down, bulk, 41.35c per lb of contained Cr; 1" x down, bulk 42.35c. Delivered.

Chromium Metal, Electrolytic: Commercial grade (Cr 99.8% min, metallic basis, Fe 0.2% max). Contract, carlot, packed 2" x D plate (about ⅛" thick) $1.29 per lb, ton lot $1.31 less ton lot $1.33. Delivered. Spot, add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open-hearth Grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.20 per lb of contained V. Delivered. Spot, add 10c. **Special Grade:** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.30. **High Speed Grade:** (V 50-55%, or 70-75%, Si 1.50% max, C 0.20% max) $3.40.

Grainal: Vanadium Grainal No. 1 $1.05 per lb; No. 6, 68c; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract, less carload lot, packed, $1.38 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

25-30% Ferrosilicon: Contract, carload, lump, bulk, 20.0c per lb of contained Si. Packed 21.40c; ton lot 22.50c, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

50% Ferrosilicon: Contract, carload, lump, bulk, 13c per lb of contained Si. Packed c.l. 15.5c, ton lot 16.95c, less ton 18.6c, f.o.b. Alloy, W. Va., Ashtabula, Marietta, O., Sheffield, Ala., and Portland, Oreg. Spot, add 0.45c.

Low-Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.45c to 50% ferrosilicon prices. **65% Ferrosilicon:** Contract, carload, lump, bulk, 15.25c per lb contained silicon. Packed, c.l. 17.25c, ton lot, 19.05c; less ton 20.4c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Contract, carload, lump, bulk, 16.4c per lb of contained Si. Packed, c.l. 18.30c, ton lot 19.95c, less ton 21.2c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Contract, carload, lump, bulk, 19.5c per lb of contained Si. Packed, c.l. 21.15c, ton lot 22.55c, less ton 23.6c. Delivered. Spot, add 0.25c.

Silicon Metal: (98% min Si, 0.75% max Fe, 0.07% max Ca). C.l. lump, bulk, 21.5c per lb of Si. Packed, c.l. 23.15c, ton lot 24.45c, less ton 25.45c. Add 0.5c for max 0.03% Ca grade. Deduct 0.5c for max 1% Fe grade analyzing min 99.75% Si; 0.75c for max 1.25% Fe grades analyzing min 96.75% Si. Spot, add 0.25c.

Alsifer: (Approx 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 10.65c per lb of alloy, ton lot, packed, 11.8c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l. lump, bulk 9.25c per lb of alloy. Packed, c.l. 10.45c, ton lot 11.6c, less ton 12.45c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Contract, carload, lump, packed 27.25c per lb of alloy, ton lot 28.4c, less ton 29.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy; less than 100 lb $1.30. Delivered. Spot, add 5c. F.o.b. Washington, Pa., prices, 100 lb and over, are as follows: Grade A (10-14% B) 85c per lb; Grade B (14-18% B) $1.20; Grade C. (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). Carload, bulk, lump, or 3" x D, $5.25 per lb of contained B. Packed, carload $5.40, ton to c.l. $5.50, less ton $5.60. Delivered.

Bortam: (B 1.5%-1.9%). Ton lot, 45c per lb; less than ton lot, 50c per lb.

Carbortam: (B 1 to 2%). Contract, lump, carload 9.50c per lb. f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Contract, carload, lump, bulk 23c per lb of alloy, carload packed 24.25c, ton lot 26.15c, less ton 27.15c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Contract, carload, lump, bulk 24c per lb of alloy, carload packed 25.65c, ton lot 27.95c, less ton 29.45c. Delivered. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx 3⅝ lb each and containing 2 lb of Cr). Contract, carload, bulk, 19c per lb of briquet, carload packed in box pallets 19.2c, in bags 20.1c; 3000 lb to c.l. in box pallets 20.4c; 2000 lb to c.l. in bags, 21.3c; less than 2000 lb in bags 22.2c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx 3 lb and containing 2 lb of Mn). Contract, carload, bulk 14.8c per lb of briquet; c.l., packed, pallets 15c, bags 16c; 3000 lb to c.l., pallets 16.2c; 2000 lb to c.l. bags, 17.2c; less ton 18.1c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx 3½ lb and containing 2 lb of Mn and approx ½ lb of Si). Contract, c.l. bulk 15.1c per lb of briquet; c.l. packed, pallets, 15.3c; bags 16.3c, 3000 lb to c.l., pallets, 16.5c; 2000 lb to c.l., bags 17.5c; less ton 18.4c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx 5 lb and containing 2 lb of Si). Contract, carload, bulk, 7.7c per lb of briquet; packed, pallets, 7.9c; bags 8.9c; 3000 lb to c.l., pallets 9.5c; 2000 lb to c.l. bags 10.5c; less ton 11.4c. Delivered. Spot, add 0.25c. (Small size—weighing approx 2½ lb and containing 1 lb of Si). Carload, bulk 7.85c. Packed, pallets 8.05c; bags 9.05c; 3000 lb to c.l. pallets 9.65c; 2000 lb to c.l. bags 10.65c; less ton 11.55c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each). $1.41 per pound of Mo contained, f.o.b. Langeloth, Pa.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%). 5000 lb W or more $2.95 per lb of contained W; 2000 lb W to 5000 lb W, $3.05; less than 2000 lb W, $3.17. Delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 50-60%, Si 8% max. C 0.4% max). Contract, ton lot, 2" x D, $5.10 per lb of contained Cb. Delivered. Spot, add 10c.

Ferrotantalum—Columbium: (Cb 40% approx Ta 20% approx, and Cb plus Ta 60% min, C 0.30% max). Ton lot 2" x D, $4.25 per lb of contained Cb plus Ta, delivered; less ton lot $5.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7%, Fe 20% approx). Contract, c.l. packed ½-in. x 12 M 19c per lb of alloy, ton lot 20.15c, less ton 21.4c. Delivered. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5.7%, Ti 9-11%). C.l. packed, 19c per lb of alloy, ton lot 20.15c; less ton lot 21.4c, f.o.b. Niagara Falls, N. Y.; Freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 18.1c per lb of alloy; ton lot 19.55c; less ton lot 20.8c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Simanal: (Approx 20% each Si, Mn, Al; bal. Fe). Lump, carload, bulk 18.50c. Packed c.l. 19.50c, 2000 lb to c.l. 20.50c less than 2000 lb 21c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $4 for each 1% of P above or below the base); carload, f.o.b. sellers' works. Mt. Pleasant, Siglo, Tenn., $90 per gross ton.

Ferromolybdenum: (55-75%). Per lb contained Mo, in 200-lb container, f.o.b. Langeloth and Washington, Pa., $1.68 in all sizes except powdered which is $1.74.

Technical Molybdic-Oxide: Per lb contained Mo, in cans, $1.39; in bags, $1.38, f.o.b. Langeloth and Washington, Pa.

Scrap Export Situation Probed

Commerce Secretary Weeks tells House Small Business Committee there are no secret agreements with big foreign buyers. Small dealer tells of inability to compete with large sellers

Scrap Prices, Page 164

Washington — A small scrap dealer stole the show last week at Rep. Wright Patman's (Dem., Tex.) Small Business Committee hearings on iron and steel scrap.

The witness told of his inability to compete with large dealers, claiming "monopolistic" practices were destroying his markets. He hit directly at the relationship between prices and the amount of scrap available to consumers: "If the price is sufficiently high, there is almost no limit to the amount of scrap which can be accumulated."

Commerce Secretary Weeks denied existence of any secret agreement between his department and big scrap buyers abroad. He said negotiations are continuing with Japanese, British and European Coal & Steel Community representatives over the current embargo on shipments of heavy melting scrap over the 1956 rate (STEEL, May 20, p. 235).

Harold C. McClellan, assistant secretary of commerce for international affairs, said the cutback in export scrap licenses, instituted May 6, was not directed solely at Japan. ECSC also is taking steel scrap over its 1956 rate.

FTC Hearings—The small scrap dealer charged that hearings now before the Federal Trade Commission on Luria Bros. & Co.'s position in the scrap business have not tended to limit Luria's position in the export market. Rep. James Roosevelt (Dem., Calif.) said FTC's inability to reach a decision in the case, which has dragged on for about four years, may be doing harm to small businessmen.

The export situation is critical, say Commerce department officials, because Britain, Japan and ECSC are taking 60 per cent of their scrap from the U.S. in heavy melting quality, whereas the normal U.S. consumer takes only 45 per cent heavy grade.

The small scrap dealer said shipments should be gaged against the 4 million tons exported in 1939, rather than against the rapidly increasing rate of export in the postwar period. Today's rate of 6 million tons exported would be a 50 per cent increase over the 1939 rate, he said.

Assistant Secretary McClellan said Commerce and State departments are asking foreign buyers to cut their take by: 1. Looking elsewhere for scrap. 2. Converting their mills to types which can use less scrap and more basic metallics.

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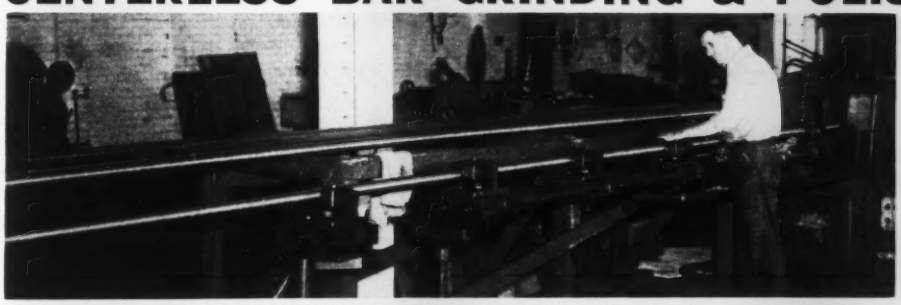

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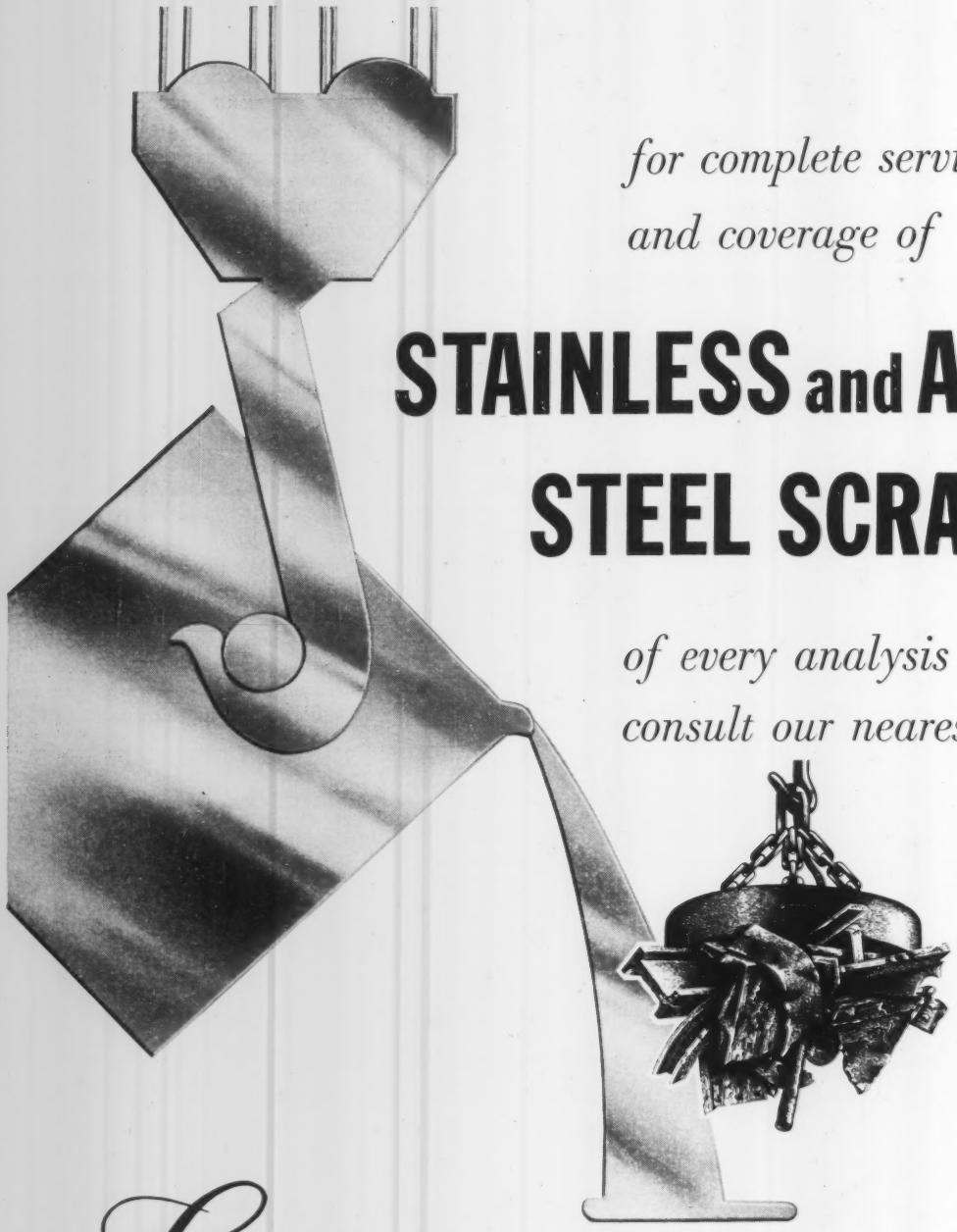

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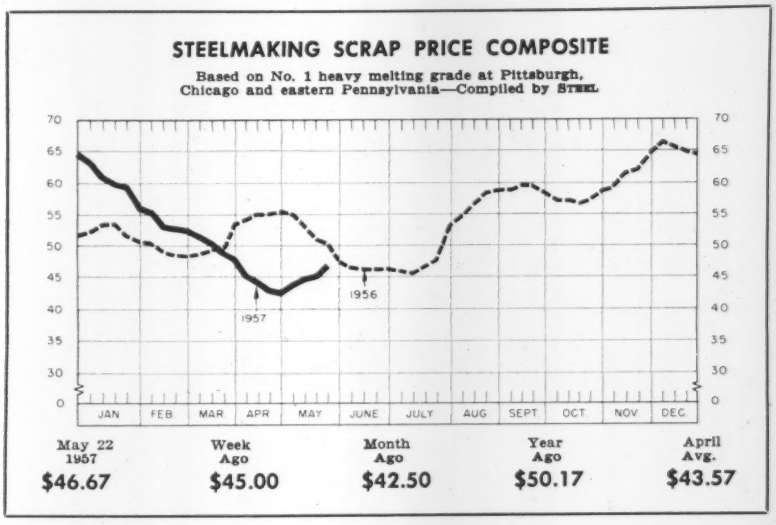


3. Designing new mills to use less scrap. 4. Locating new sources of basic metallics, ores, coal and fuel.

Philadelphia — Prices have advanced sharply here, continuing the uptrend that has prevailed since the start of the month. No. 1 heavy melting is higher at $52, delivered, and No. 1 bundles and No. 1 busheling have sold at $54 for open hearth consumption, placing these grades at a substantial premium over No. 1 heavy melting. Usually these grades are on a parity. No. 2 heavy melting has sold at $43 and No. 2 bundles at $42. Electric furnace bundles have jumped to $55, delivered.

New York—Scrap brokers have advanced their buying prices, now offering $46-$47 for No. 1 heavy melting, $36-$37 for No. 2 heavy melting, $47-$48 for No. 1 bundles, and $33-$34 for No. 2 bundles.

Reflecting general shortage of material, prices also have advanced on other grades. Brokers are paying $26-$27 for machine shop turnings, $29-$30 for mixed borings and turnings, $30-$30.50 for short shoveling turnings, and $49-50 for low phos structurals and plates. They are covering on No. 1 cupola cast at $43-$44, on unstripped motor blocks at $34-$35, and on heavy breakable at $46-$47.

Stainless steel scrap specialties are quiet and unchanged.

Boston—Primary grades of steelmaking scrap, No. 1 heavy melting, bundles and busheling are edging up as prices make a hesitant recovery. Brokers are now paying up to $38, shipping point.

Chicago—The scrap market here continues to rise. A number of important grades have advanced $2 to $3 a ton, partly as the result of limited buying in the district, some purchases in the adjacent area, and much activity in broker-dealer transactions.

The question remains as to whether a real reversal of the market trend is in the making. It is no secret that brokers are buying heavily and are being forced to pay higher prices to dealers for material needed to fill outstanding orders.

Cincinnati—Some scrap brokers here report a stronger market undertone. Others note little change in the over-all situation. No. 1 heavy melting steel is still quoted at $37-$38, brokers' buying price.

Buffalo—Cast scrap advanced $2 a ton last week on the sale of a representative tonnage of cupola grade at $42. No. 1 machinery cast advanced to $47. The increase reflects underlying strength in specialties.

Detroit—Scrap prices are up slightly. Smaller auto scrap lists have resulted from cutbacks in production. Mills are slow to place orders for scrap tonnage. Most of the activity in the market is among dealers and brokers.

(*Please turn to page* 169)

Sale of Diesel-Electric Locomotives

under

New York, Ontario and Western Railway

Equipment Trusts of 1945 and 1947

June 25, 1957

Pursuant to an order of the United States District Court for the Southern District of New York, filed in the office of the Clerk of said Court on May 13, 1957, in the cause entitled *United States of America v. Louis D. Freeman, Trustee, etc., et al.* (Civil Action 116-204), the undersigned will sell at public sale at the United States Court House, Foley Square, New York City, on June 25, 1957, at 10:00 o'clock in the forenoon, Eastern Daylight Saving Time, or at such later hour and day to which such sale may be adjourned, the property in said order described and therein authorized to be sold, to which order reference is made for the terms of sale and for a description of said property, which consists of diesel-electric locomotives built by General Motors Corporation and covered by the above described Equipment Trusts, as follows:

9 2,700 h.p. freight locomotives each consisting of 2 units of 1,350 h.p.;
7 1,500 h.p. freight locomotives each consisting of 1 unit; and
21 1,000 h.p. switching locomotives.

Said freight locomotives are presently located at the New York, Ontario and Western Railway Middletown yard at Middletown, N. Y., and said switching locomotives are presently located at the New York Central Railroad Selkirk yard at Selkirk, N. Y.

Copies of the required Form of Bid, together with the Invitation to Bid and said order, may be obtained from, and arrangements for the inspection of said locomotives prior to sale may be made with, The Hanover Bank (Mr. J. T. Harrigan, Senior Vice President), 70 Broadway, New York 15, N. Y., or Jacob Grumet and James B. Kilsheimer, III, Receivers of the property of New York, Ontario and Western Railway Company, 39 Broadway, New York, N. Y.

THE HANOVER BANK,
Trustee of said Equipment Trusts.

Dated, May 15, 1957.

Iron and Steel Scrap

Consumer prices, per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL, May 22, 1957. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

May 22	$46.67
May 15	45.00
Apr. Avg.	43.57
May 1956	50.34
May 1952	43.00

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	*45.00-46.00*
No. 2 heavy melting	*42.00-43.00*
No. 1 factory bundles	*50.00-51.00*
No. 1 dealer bundles	*45.00-46.00*
No. 2 bundles	*40.00-41.00*
No. 1 busheling	*45.00-46.00*
Machine shop turnings	31.00-32.00
Mixed borings, turnings	31.00-32.00
Short shovel turnings	35.00-36.00
Cast iron borings	35.00-36.00
Cut structurals, 3 ft lengths	51.00-52.00
Cut structurals, 2 ft and under	52.00-53.00
Heavy turnings	*43.00-44.00*
Punchings & plate scrap	51.00-52.00
Electric furnace bundles	51.00-52.00

Cast Iron Grades

No. 1 cupola	*46.00-47.00*
Heavy breakable cast	*43.00-44.00*
Unstripped motor blocks	34.00-35.00
No. 1 machinery cast	*55.00-56.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*51.00-52.00*
Rails, 2 ft and under	*67.00-68.00*
Rails, 18 in. and under	*68.00-69.00*
Rails, random lengths	*61.00-62.00*
Railroad specialties	*62.00-63.00*

Stainless Steel Scrap

18-8 bundles & solids	290.00-300.00
18-8 turnings	190.00-210.00
430 bundles & solids	75.00-80.00
430 turnings	55.00-60.00

CLEVELAND

No. 1 heavy melting	38.00-39.00
No. 1 factory bundles	44.50-45.50
No. 2 heavy melting	36.00-37.00
No. 1 bundles	38.00-39.00
No. 2 bundles	32.00-33.00
No. 1 busheling	38.00-39.00
Machine shop turnings	20.00-21.00
Short shovel turnings	23.00-24.00
Mixed borings, turnings	23.00-24.00
Cast iron borings	23.00-24.00
Cut foundry steel	43.00-44.00
Cut structurals, plates 2 ft and under	48.00-49.00
Low phos. punchings & plate	42.00-43.00
Alloy free, short shovel turnings	26.00-27.00
Electric furnace bundles	42.00-43.00

Cast Iron Grades

No. 1 cupola	48.00-49.00
Charging box cast	37.00-38.00
Heavy breakable cast	37.00-38.00
Stove plate	45.00-46.00
Unstripped motor blocks	30.00-31.00
Brake shoes	37.00-38.00
Clean auto cast	48.00-49.00
Burnt cast	35.00-36.00
Drop broken machinery	50.00-51.00

Railroad Scrap

No. 1 R.R. heavy melt.	48.00-49.00
R.R. malleable	56.00-57.00
Rails, 2 ft and under	69.00-70.00
Rails, 18 in. and under	*70.00-71.00*
Rails, random lengths	64.00-65.00
Cast steel	55.00-56.00
Railroad specialties	59.00-60.00
Uncut tires	58.00-59.00
Angles, splice bars	59.00-60.00
Rails, rerolling	67.00-68.00

Stainless Steel (Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	309.00-310.00
18-8 turnings	200.00-210.00
430 clips, bundles, solids	75.00-80.00
430 turnings	40.00-50.00

YOUNGSTOWN

No. 1 heavy melting	43.00-44.00
No. 2 heavy melting	40.00-41.00
No. 1 bundles	43.00-44.00
No. 2 bundles	36.00-37.00
No. 1 busheling	45.00-46.00
Machine shop turnings	20.00-21.00
Short shovel turnings	23.00-24.00
Cast iron borings	23.00-24.00
Low phos.	45.00-46.00
Electric furnace bundles	45.00-46.00

Railroad Scrap

No. 1 R.R. heavy melt.	50.00-51.00

CHICAGO

No. 1 hvy melt. indus.	*43.00-44.00*
No. 1 hvy melt. dealer	*41.00-42.00*
No. 2 heavy melting	*39.00-40.00*
No. 1 factory bundles	*46.00-47.00*
No. 1 dealer bundles	*41.00-42.00*
No. 2 bundles	*34.00-35.00*
No. 1 busheling, indus.	*43.00-44.00*
No. 1 busheling, dealer	*41.00-42.00*
Machine shop turnings	*26.00-27.00*
Mixed borings, turnings	*28.00-29.00*
Short shovel turnings	*28.00-29.00*
Cast iron borings	*28.00-29.00*
Cut structurals, 3 ft.	*49.00-50.00*
Punchings & plate scrap	*50.00-51.00*

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Stove plate	*40.00-41.00*
Unstripped motor blocks	*32.00-33.00*
Clean auto cast	*47.00-48.00*
Drop broken machinery	*47.00-48.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*49.00-50.00*
R.R. malleable	*55.00-56.00*
Rails, 2 ft and under	*61.00-62.00*
Rails, 18 in. and under	*62.00-63.00*
Angles, splice bars	*56.00-57.00*
Rails, rerolling	*61.00-62.00*

Stainless Steel Scrap

18-8 bundles & solids	310.00-315.00
18-8 turnings	210.00-215.00
430 bundles & solids	75.00-80.00
430 turnings	50.00-55.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*37.00-38.00*
No. 2 heavy melting	*31.00-32.00*
No. 1 bundles	*37.00-38.00*
No. 2 bundles	*31.00-32.00*
No. 1 busheling	*36.00-37.00*
Machine shop turnings	23.00-24.00
Mixed borings, turnings	24.00-25.00
Short shovel turnings	*25.00-26.00*
Punchings & plate scrap	*44.00-45.00*

Cast Iron Grades

No. 1 cupola	45.00
Charging box cast	*40.00*
Stove plate	41.00
Heavy breakable	36.00
Unstripped motor blocks	*28.00*
Clean auto cast	47.00
Malleable	52.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	41.00
No. 2 heavy melting	37.00
No. 1 bundles	41.00
No. 2 bundles	32.00
No. 1 busheling	41.00
Machine shop turnings	24.00
Short shovel turnings	27.00

Cast Iron Grades

No. 1 cupola	43.00
Charging box cast	37.00
Heavy breakable cast	37.00
Unstripped motor blocks	37.00
Brake shoes	40.00
Clean auto cast	48.00
Stove plate	39.00

Railroad Scrap

No. 1 R.R. heavy melt.	*47.25*
Rails, 18 in. and under	*61.00*
Rails, rerolling	64.00
Rails, random lengths	59.00
Angles, splice bars	56.00

PHILADELPHIA

No. 1 heavy melting	*52.00*
No. 2 heavy melting	*43.00*
No. 1 bundles	*54.00*
No. 2 bundles	*42.00*
No. 1 busheling	*54.00*
Electric furnace bundles	*55.00*
Mixed borings, turnings	*36.00*
Short shovel turnings	*37.50-38.00*
Machine shop turnings	*34.50-35.00*
Heavy turnings	*48.00*
Structurals & plate	*54.00-56.00*
Couplers, springs, wheels	*60.00*
Rail crops, 2 ft & under	*67.00-69.00*

Cast Iron Grades

No. 1 cupola	*46.00*
Heavy breakable cast	*55.00*
Malleable	*62.00*
Drop broken machinery	*57.00-58.00*

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	*46.00-47.00*
No. 2 heavy melting	*36.00-37.00*
No. 1 bundles	*47.00-48.00*
No. 2 bundles	*33.00-34.00*
Machine shop turnings	*26.00-27.00*
Mixed borings, turnings	*29.00-30.00*
Short shovel turnings	*30.00-30.50*
Low phos. (structurals & plate)	*49.00-50.00*

Cast Iron Grades

No. 1 cupola	*43.00-44.00*
Unstripped motor blocks	*34.00-35.00*
Heavy breakable	*46.00-47.00*

Stainless Steel

18-8 sheets, clips solids	305.00
18-8 borings, turnings	200.00
430 sheets, clips, solids	60.00-70.00
410 sheets, clips, solids	50.00-60.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*37.00-38.00*
No. 2 heavy melting	29.50-31.00
No. 1 bundles	*37.00-38.00*
No. 2 bundles	*28.00-29.00*
No. 1 busheling	*37.00-38.00*
Machine shop turnings	21.00-22.00
Mixed borings, turnings	22.50-23.50
Short shovel turnings	*26.00-26.50*
No. 1 cast	34.00-35.00
Mixed cupola cast	33.00-34.00
No. 1 machinery cast	42.00-43.00

BUFFALO

No. 1 heavy melting	40.00-41.00
No. 2 heavy melting	36.00-37.00
No. 1 bundles	40.00-41.00
No. 2 bundles	33.00-34.00
No. 1 busheling	40.00-41.00
Mixed borings, turnings	29.00-30.00
Machine shop turnings	27.00-28.00
Short shovel turnings	30.00-31.00
Cast iron borings	29.00-30.00
Low phos.	44.00-45.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	*41.00-42.00*
No. 1 machinery	*46.00-47.00*

Railroad Scrap

Rails, random lengths	53.00-54.00
Rails, 3 ft and under	59.00-60.00
Railroad specialties	47.00-48.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	37.00-38.00
No. 2 heavy melting	33.00-34.00
No. 1 bundles	37.00-38.00
No. 2 bundles	30.00-31.00
No. 1 busheling	37.00-38.00
Machine shop turnings	25.00-26.00
Mixed borings, turnings	23.00-24.00
Short shovel turnings	27.00-28.00
Cast iron borings	23.00-24.00
Low phos. 18 in.	49.00-50.00

Cast Iron Grades

No. 1 cupola	43.00-44.00
Heavy breakable cast	42.00-43.00
Charging box cast	42.00-43.00
Drop broken machinery	55.00-56.00

Railroad Scrap

No. 1 R.R. heavy melt.	41.00-42.00
Rails, 18 in. and under	64.00-65.00
Rails, random lengths	54.00-55.00

BIRMINGHAM

No. 1 heavy melting	39.00-40.00
No. 2 heavy melting	33.00-34.00
No. 1 bundles	39.00-40.00
No. 2 bundles	26.00-27.00
No. 1 busheling	39.00-40.00
Cast iron borings	26.00-27.00
Short shovel turnings	30.00-31.00
Machine shop turnings	28.00-29.00
Bar crops and plates	*49.00-50.00*
Structurals & plate	*48.00-49.00*
Electric furnace bundles	*45.50-46.50*
Electric furnace:	
3 ft and under	*43.50-44.50*
2 ft and under	*44.50-45.50*

(F.o.b. shipping point) Cast Iron Grades

No. 1 cupola	47.50-48.50
Stove plate	47.00-48.00
Unstripped motor blocks	38.00-39.00
Charging box cast	34.00-35.00
No. 1 wheels	37.00-38.00

Railroad Scrap

No. 1 R.R. heavy melt.	41.00-42.00
Rails, 18 in. and under	*58.00-59.00*
Rails, rerolling	60.00-61.00
Rails, random lengths	50.00-51.00
Angles, splice bars	53.00-54.00

SEATTLE

No. 1 heavy melting	48.00
No. 2 heavy melting	45.00
No. 1 bundles	45.00
No. 2 bundles	26.00-28.00
Machine shop turnings	28.00-30.00
Mixed borings, turnings	28.00-30.00
Electric furnace No. 1	56.00

Cast Iron Grades

No. 1 cupola	50.00
Heavy breakable cast	48.00
Unstripped motor blocks	40.00
Stove plate (f.o.b. plant)	42.00

LOS ANGELES

No. 1 heavy melting	46.00
No. 2 heavy melting	43.00
No. 1 bundles	47.00
No. 2 bundles	33.00
Machine shop turnings	32.00
Shoveling turnings	33.00
Cast iron borings	34.00
Cut structural and plate, 1 ft and under	57.00

Cast Iron Grades (F.o.b. shipping point)

No. 1 cupola	54.00

Railroad Scrap

No. 1 R.R. heavy melt.	48.00

SAN FRANCISCO

No. 1 heavy melting	48.00
No. 2 heavy melting	43.00
No. 1 bundles	47.00
No. 2 bundles	35.00
Machine shop turnings	32.00
Mixed borings, turnings	32.00
Cast iron borings	32.00
Heavy turnings	32.00
Short shovel turnings	34.00
Cut structurals, 3 ft	60.00

Cast Iron Grades

No. 1 cupola	55.00
Charging box cast	47.00-49.00
Stove plate	48.00
Heavy breakable cast	42.00
Unstripped motor blocks	50.00
Clean auto cast	57.00
No. 1 wheels	50.00
Drop broken machinery	55.00

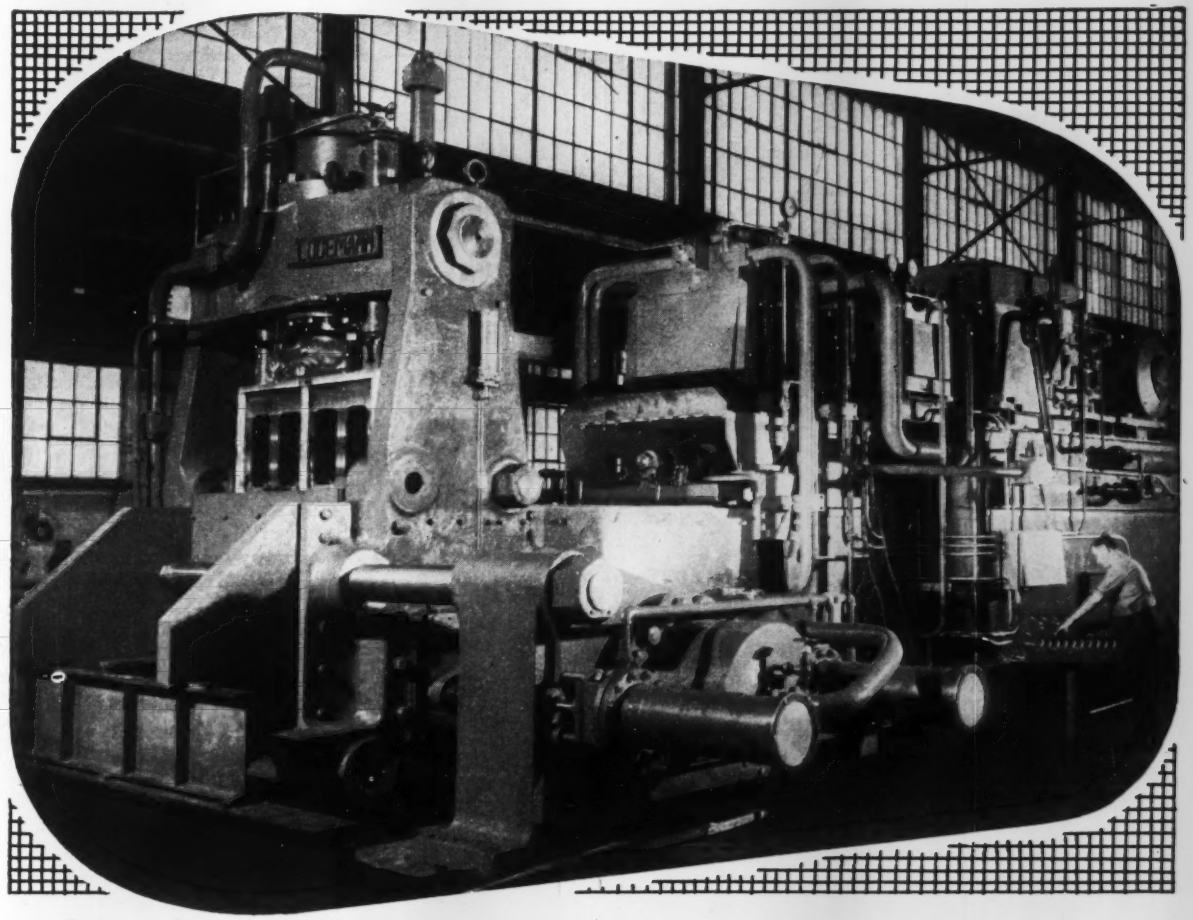
HAMILTON, ONT.

No. 1 heavy melting	43.00
No. 2 heavy melting	38.00
No. 1 bundles	43.00
No. 2 bundles	32.00
Mixed steel scrap	35.00
Mixed borings, turnings	19.00
Busheling, new factory: Prepared	43.00
Unprepared	37.00
Short steel turnings	30.00
Rails, rerolling	49.00

Cast Iron Grades†

No. 1 machinery cast	50.00

†F.o.b. Hamilton, Ont.



A New LOGEMANN *Triple Compression* METAL BALING PRESS

★ COMPLETELY AUTOMATIC ★ MINIMUM INSTALLATION COST ★ TOP FILL
★ BOTTOM DISCHARGE CLEANS BOX EVERY BALE ★ RECORDS SHOW A 50 TO 55 TON SUSTAINED HOURLY OUTPUT OF HIGH DENSITY BALES

To meet the demands of modern automobile and body plants for automation, LOGEMANN has installed a number of these new type scrap presses for baling unprecedented tonnages of steel sheet-scrap. This unit can be adapted to other types of plants and other sheet metals with some modifications to suit the conditions and requirements of the user.

Hydraulic pressure for the operation of the main press rams is generated by two 150 H.P. opposed-cylinder pumps. One of the features of this bottom-drop press is the fact that loose chips, small slivers and punchings are cleared from the press box with each bale, instead of being retained within the box to possibly cause interference on subsequent bales.

OPERATION IS ENTIRELY AUTOMATIC. The supervising operator, with his electrical control-board, can be remotely located. In some cases, a closed circuit television screen is used to show operator the loading of press and hopper.

It will pay you to investigate the merits of this new unit. When making your inquiry, please give us the amount of tonnage required, and the nature of your scrap.

Write for further details.

LOGEMANN BROTHERS CO.

3126 W. BURLEIGH STREET • MILWAUKEE 10, WISCONSIN

Price Level Far from Firm

Some government help for lead and zinc seems assured, but metals men wonder if it's enough. Controversy about profitability of 32-cent copper grows

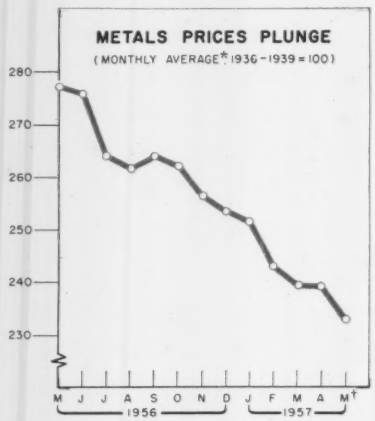
Nonferrous Metal Prices, Pages 168 & 169

USERS of nonferrous metals are delighted by the decline in prices shown in the accompanying chart, but producers are somewhat less than happy. They may be even unhappier before the summer is over.

The serious condition in the lead and zinc industry is compounded by the evasiveness of government officials about the status of price supports. The barter program is scheduled to be cleared up this week, but metals men aren't sure they'll like the disclosure. It seems that the stability of the lead and zinc markets is not the only concern of the program's planners. Now they're worried that the barter program might be cutting down on some cash transactions for our goods. Nobody wants to trade excess farm products for foreign metals even Stephen when maybe they can get a few dollars by selling. In any case, when and if the program is continued, it is almost sure to be on a reduced basis, which will be a blow to the metals men.

GSA Helps? — Last week, the General Services Administration issued a call for stockpile lead and zinc, and the London market responded immediately by jumping to the equivalent of about 12 cents a pound for lead and 10.5 cents a pound for zinc, the highest levels in several days. But domestic producers wondered what effect it would have on them because both funds and stockpile goals are running out. Although Gordon Gray, defense mobilizer, said the purchases would be increased, nobody expects GSA to fill enough of the gap to push prices upward. And as long as there is a chance that prices may go down another notch or two, purchasing agents aren't going to buy any farther ahead than they have to.

While nobody is crowing about business in the copper industry, there is evidence that things are picking up. April statistics compiled by the Copper Institute show that, in some respects, the industry had its best month in almost a year. U.S. primary production of 98,856 tons was the best mark since last May. Refined production of 144,013 tons also was the best mark since last May. Deliveries to fabricators totaled 116,716 tons, the best since last June. Even refined stocks declined about 350 tons, but at 139,842 tons they are still more than double the year-ago figure.



* Weighted composite of copper, zinc, lead, aluminum and tin prices.
† Estimated.

Who's Right?—Copper's price is none too stable, either. Although it hasn't changed since the 30-32 cent a pound spread was established on May 9, weakness on the London market could prompt domestic producers to take a second look at any time. While Roy H. Glover, chairman of Anaconda Co., says the primary price of 32 cents is insufficient to maintain present production, E. H. Westlake, president, Miami Copper Co., says his much smaller company can operate profitably at that level. "The price will have to go lower than it is now before we will be in the red," he says.

Minor Metals Dip, Too

Some of the minor metals also are dropping in price, but in most cases both producers and consumers are happy about it. Technological changes are bringing the prices into more competitive line with other materials. U.S. Industrial Chemicals Co. says it will be selling reactor grade zirconium at $4.75 to $6.50 a pound by the end of June. Commercial grades containing hafnium will sell for about $1.50 a pound less. Some government contracts still call for $12.50 to $15 a pound for hafnium-free zirconium.

While the market for columbium has not settled, one producer has reduced the price for pure metal to $16 a pound. Germanium prices are being reduced 5 to 10 per cent. Looking farther into the future, Frank H. Vandenburgh, vice presi-

NONFERROUS PRICE RECORD

	Price May 22	Last Change	Previous Price	Apr. Avg.	Mar. Avg.	May, 1956 Avg.
Aluminum	27.10	Aug. 10, 1956	25.90	27.100	27.100	25.900
Copper	30.00–32.00	May 9, 1957	30.50–32.00	31.598	31.462	45.096
Lead	14.80	May 16, 1957	15.30	15.800	15.800	15.800
Magnesium	35.25	Aug. 13, 1956	33.75	35.250	35.250	33.750
Nickel	74.00	Dec. 6, 1956	64.50	74.000	74.000	64.500
Tin	98.00	May 20, 1957	97.875	99.276	99.683	97.024
Zinc	11.50	May 14, 1957	11.50–12.00	13.500	13.500	13.500

Quotations in cents per pound based on: COPPER, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingots, 99 + %, deld.; MAGNESIUM, pig, 99.8%, Velasco, Tex.

dent and general manager of Mallory-Sharon Titanium Corp., Niles, O., foresees a mature titanium industry which will produce mill products for about $2 a pound and have a yearly capacity of several hundred thousand tons.

Aluminum Alloy Developed

A new heat treatable aluminum alloy (X6463) has been developed by Aluminum Co. of America. It will be used for high finish anodized aluminum extruded shapes. Possible applications: Automotive bumpers, grilles, exterior and interior trim panels. Architectural and appliance uses are anticipated, too.

Lithium Uses Grow

The American Lithium Institute reports that this metal is finding a growing list of applications. Samples: It's being used in ceramics, automotive greases, air conditioning, welding and brazing, alkaline storage batteries, alloys and metal refining.

Tungsten Battle Rages

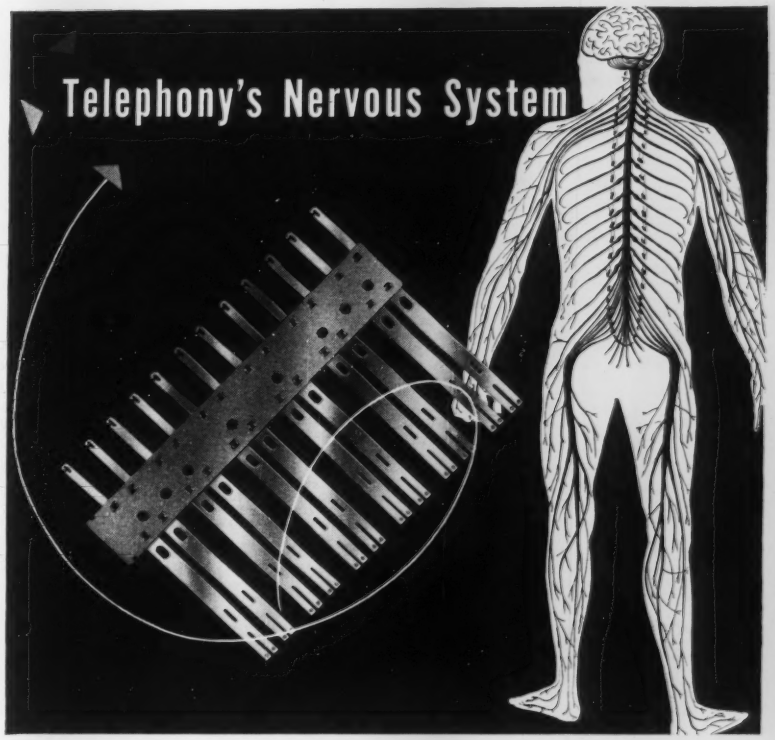
The Senate wants to give tungsten miners more money. The House is against it. Result: Stalemate.

Reports one Washington source: "Tungsten may be the metal which will break the heat barrier that has halted the efforts of engine and plane builders to press further into supersonic speeds. It is estimated that alloys containing up to 50 per cent tungsten will provide metal that will resist the heat of skin friction above Mach 2."

The Senate appropriations committee has again voted to provide $30 million to buy tungsten, asbestos, fluorspar and columbium-tantalum. This would be a stopgap measure to provide funds for the rest of the fiscal year.

Copper a Barter Item

Copper is now on the approved list of materials which can be obtained from foreign producers under the U.S. barter program when it is resumed.



. . . relies on "neurons" of Seymour Nickel Silver

Dial telephones carry your voice to the ends of the earth through an intricate electrical network which closely resembles the human nervous system. Seymour nickel silver plays a key role in modern communications as part of the North Electric Company "Crossbar Switching System" which automates independent telephone exchanges.

Tiny, neuron-like contacts on North Crossbar switch assemblies rely on flat springs of even-tempered Seymour nickel silver for *trillions* of "makes-and-breaks".

Easy to work, corrosion-resistant and possessing excellent conductivity, Seymour nickel silver has an enviable reputation for quality and uniformity among hundreds of manufacturers who say: — "Specify SEYMOUR. You KNOW it's good!"

Perhaps Seymour metallurgists can help solve your materials problems. Tell us your requirements.

Long distance telephone operators link distant points to the North Crossbar System in Seymour, Indiana.

THE SEYMOUR MANUFACTURING COMPANY
3 FRANKLIN STREET
SEYMOUR, CONNECTICUT

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99+%, ingots, 27.10; pigs, 25.00, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 28.90; No. 43, 28.70; No. 195, 30.30; No. 241, 30.50; No. 356, 28.90, 30-lb ingots.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb, ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 97-99%, $2.35 per lb for 550-lb keg; $2.37 per lb for 100-lb case; $2.42 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 32.00 deld. Conn. valley; 32.00 deld. Midwest; custom smelters, 30.50 deld.; lake, 32.00 deld.; fire refined, 31.75 deld.

Germanium: First reduction $201.85-220 per lb; intrinsic grade, $220-242.67 per lb, depending on quantity.

Gold: U.S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $100-110 nom. per troy oz.

Lead: Common, 14.80; chemical, 14.90; corroding, 14.90, St. Louis. New York basis, add 0.20.

Lithium: 98+%, cups or ingots, $11.50; rod, $13.50; shot or wire, $14.50, f.o.b. Minneapolis, 100 lb lots.

Magnesium: Pig, 35.25; ingot, 36.00, f.o.b. Velasco, Tex., 13 in. sticks, 59.00, f.o.b. Madison, Ill.

Magnesium Alloys: AZ91B (diecasting), 37.25 deld.; AZ63A, AZ92A, AZ91C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $255-257 per 76-lb flask.

Molybdenum: Extruded ingot, $9.60 per pound, f.o.b. Detroit.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot or ingots for addition to cast iron, 74.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01.

Osmium: $80-100 per troy oz, nom.

Palladium: $23-24 per troy oz.

Platinum: $91-95 per troy oz from refineries.

Radium: $16-21.50 per mg radium content, depending on quantity.

Rhodium: $118-125 per troy oz.

Ruthenium: $45-55 per troy oz.

Selenium: 99.5%, $12-15 per lb.

Silver: Open market, 91.375 per troy oz.

Sodium: 16.50, c.l.; 17.00, l.c.l.

Tantalum: Sheet, rod, $68.70 per lb; powder, $56.63 per lb.

Tellurium: $1.60-1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N.Y., spot and prompt, 98.00.

Titanium: Sponge, 99.3+%, grade A-1 ductile (0.3% Fe max.), $2.75; grade A-2 (0.5% Fe max.), $2.50 per lb.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $4.00 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00; 99+% hydrogen reduced, $4.75.

Zinc: Prime Western, 11.50; brass special, 11.75; intermediate, 12.00; East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 12.85; special high grade, 13.25 deld. Die casting alloy ingot No. 3, 15.50; No. 2, 16.50; No. 5, 16.00 deld.

Zirconium: Ingots, commercial grade, $14.40 per lb; low-hafnium reactor grade, $23.07. Sponge, commercial grade, $10 per lb; reactor grade, $14-22 per lb depending on quantity. Powder electronics grades, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 23.00-28.25, No. 12 foundry alloy (No. 2 grade), 21.00-22.00; 5% silicon alloy, 0.60 Cu max., 24.00-24.50; 13 alloy, 0.60 Cu max., 24.00.24.50; 195 alloy, 23-75-25.25; 108 alloy, 21.50-22.00. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 22.75; grade 2, 21.00; grade 3, 20.00; grade 4, 19.25.

Brass Ingot: Red brass, No. 115, 30.50; tin bronze, No. 225, 40.00; No. 245, 34.50; high-leaded tin bronze, No. 305, 34.50; No. 1 yellow, No. 405, 25.00; manganese bronze, No. 421, 28.00.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.50; AZ91C, 37.50; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.83-1.86, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.80, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 37.355; l.c.l., 37.98. Weatherproof, 30,000-lb lots, 37.78; l.c.l., 38.53. Magnet wire deld., 15,000 lb or more, 44.68; l.c.l., 45.43.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $20.50 per cwt; pipe, full coils, $20.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheets and strip, $11.00-14.75; sheared mill plate, $9.25-11.25; wire, $8.50-11.00; forging billets, $6.85-7.10; hot-rolled and forged bars, $7.10-7.35.

ZINC

(Prices per lb, c.l., f.o.b. mill.) Sheets, 24.00; ribbon zinc in coils, 21.00; plates, 19.50.

ZIRCONIUM

Plate, $20.35; H.R. strip, $23.95; C.R. strip, $32.00; forged or H.R. bars, $18.40; wire, 0.015 in., 8.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	126	106	128
Strip, C.R.	124	108	138
Plate, H.R.	120	105	121
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	200

ALUMINUM

Sheet and Circles: 1100 and 3003 mill finish (30,000 lb base; freight allowed).

Thickness Range Inches	Flat Sheet	Coiled Sheet
0.249-0.138	40.90-45.40	....
0.135-0.096	41.40-46.50	37.70-39.60
0.095-0.077	42.10-48.30	37.80-39.80
0.076-0.061	42.70-50.60	38.20-40.50
0.060-0.048	43.40-52.90	38.80-41.50
0.047-0.038	43.90-55.60	38.60-42.90
0.037-0.030	44.30-50.00	40.40-44.70
0.029-0.024	44.90-52.40	41.00
0.023-0.019	45.80-52.20	42.00
0.018-0.017	46.50-53.30	42.60
0.016-0.015	47.50-53.90	43.40
0.014	48.50-50.90	44.40
0.013-0.012	49.70-52.10	45.10
0.011	50.70-53.70	46.30
0.010-0.0095	52.10-54.40	47.60
0.009-0.0085	53.40	49.10
0.008-0.0075	55.00	50.03
0.007	56.50	51.80
0.006	58.10	53.20

ALUMINUM (continued)

Plates and Circles: Thickness 0.250-3 in., 24-60 in. width or diam., 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	40.2	44.5
5050-F	41.3	45.6
3004-F	42.3	47.5
5052-F	42.9	48.2
6061-T6	44.4	50.0
2024-T4*	48.1	54.4
7075-T6*	55.4	62.5

*24-48 in. width or diam., 72-180 lengths.

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
Drawn				
0.125	74.30	71.50	....	....
0.156-0.172	63.00	60.40	....	....
0.188	63.00	60.40	....	76.40
0.219-0.234	59.70	57.20	....	....
0.250-0.281	59.70	57.20	....	73.00
0.313	59.70	57.20	....	69.60
0.344	58.50	....	....	....
Cold-Finished				
0.375-0.547	58.80	57.50	70.10	65.50
0.563-0.688	58.80	57.50	66.70	61.60
0.750-1.000	57.40	56.00	61.00	58.10
1.063	57.40	56.00	....	56.10
Rolled				
1.125-1.500	55.20	53.90	59.00	56.10
1.563	53.70	52.40	....	....
1.625-2.000	53.10	51.60	....	....
2.125-2.500	51.70	50.30	....	....
2.563-3.375	50.20	48.70	....	....

Forging Stock: Round, Class 1, 43.30-55.90 in specific lengths, 36-144 in., diam. 0.375-8 in. Rectangles and squares, Class 1, 48.10-63.20 in random lengths, 0.375-4 in. thick, width 0.0750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, standard lengths, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
⅜	$18.45	2	$ 57.00
1	29.00	4	157.20
1¼	39.25	6	281.65
1½	46.95	8	423.80

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	43.10-44.60	57.80-61.80
12-14	43.40-44.80	58.40-62.70
15-17	43.60-45.40	59.60-64.30
18-20	44.10-45.80	61.50-66.80

MAGNESIUM

Sheet and Plate: AZ31B standard grade, 0.32 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.0 in., 67.90. AZ31B spec. grade, .032 in., 171.30; .081 in., 108.70; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Thread plate, .188 in., 71.70; .250-2.00 in., 70.60. Tooling plates, .250-3.0 in., 73.0.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	69.60-72.40	84.60-87.40
12-14	70.70-73.00	85.70-88.00
24-26	75.60-76.30	90.60-91.30
36-38	89.20-90.30	104.20-105.30

NONFERROUS SCRAP

DEALER'S BUYING PRICES

(Cents per pound, New York, in ton lots.)

Aluminum: 1100 clippings, 13.00-13.50; old sheets, 9.50-10.00; borings and turnings, 6.50-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnings
Copper	54.13b	51.36c	....	54.32	28.000	28.000	27.250
Yellow Brass	46.85	34.97d	47.39	49.76	21.250	21.000	19.375
Low Brass, 80%	49.80	49.74	50.34	52.61	23.750	23.500	23.000
Red Brass, 85%	50.84	50.78	51.38	53.65	24.750	24.500	24.000
Com. Bronze, 90%	52.43	52.42	53.02	55.04	25.750	25.500	25.500
Manganese Bronze	54.65	48.75	59.25	....	19.750	19.500	19.000
Muntz Metal	48.99	44.80	....	....	20.000	19.750	19.250
Naval Brass	50.91	45.22	57.97	54.32	19.750	19.500	19.000
Silicon Bronze	58.60	57.79	58.64	60.68e	27.375	27.125	26.375
Nickel Silver, 10%	63.56	65.89g	65.89	....	27.750	27.750	13.750
Phos. Bronze, A-5%	73.17	73.67	73.67	74.85	28.875	28.625	27.625

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. g. Leaded

7.00; crankcases, 9.50-10.00; industrial castings, 9.50-10.00.

Copper and Brass: No. 1 heavy copper and wire, 23.00-23.50; No. 2 heavy copper and wire, 21.50-22.00; light copper, 19.75-20.25; No. 1 composition red brass, 20.00-20.50; No. 1 composition turnings, 19.50-20.00; yellow brass turnings, 11.50-12.00; new brass clippings, 19.00-19.50; light brass, 12.00-12.50; heavy yellow brass, 14.00-14.50; new brass rod ends, 16.50-17.00; auto radiators, unsweated, 15.00-15.50; cocks and faucets, 16.50-17.00; brass pipe, 17.00-17.50.

Lead: Heavy, 10.50-11.00; battery plates, 5.75-6.00; linotype and stereotype, 12.75-13.25; electrotype, 12.25-12.75; mixed babbitt, 12.00-12.50.

Monel: Clippings, 45.00-48.00; old sheets, 44.00-48.00; turnings, 35.00-40.00; rods, 45.00-48.00.

Nickel: Sheets and clips, 80.00-90.00; rolled anodes, 80.00-90.00; turnings, 65.00-75.00; rod ends, 85.00-100.00.

Zinc: Old zinc, 3.00-3.25; new die-cast scrap, 2.75-3.50; old die-cast scrap, 1.50-2.00.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 16.50; 3003 clippings, 16.50; 6151 clippings, 16.50; 5052 clippings, 16.00-16.50; 2014 clippings, 15.50-16.00; 2017 clippings, 15.50-16.00; 2024 clippings, 15.50-16.00; mixed clippings, 15.00; old sheets, 13.00-13.50; old cast, 13.00-13.50; clean old cable (free of steel), 15.50-16.50; borings and turnings, 13.50-14.50.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 54.00; light scrap, 49.00; turnings and borings, 34.00.

Copper and Brass: No. 1 heavy copper and wire, 26.50; No. 2 heavy copper and wire, 24.25; light copper, 22.00; refinery brass (60% copper) per dry copper content, 23.50.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 26.50; No. 2 heavy copper and wire, 24.25; light copper, 22.00; No. 1 composition borings, 22.50; No. 1 composition solids, 23.00 heavy yellow brass solids, 17.00; yellow brass turnings, 16.00; radiators, 17.75.

PLATING MATERIALS

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 50.29; oval, 49.42, 5000-10,000 lb; electrodeposited, 39.25, 2000-5000 lb lots; cast, 44.00, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, 101.50; 100-499 lb, 99.50; 500-4999 lb, 95.50; 5000-29,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 116.50; 200-499 lb, 115.00; 500-999 lb, 114.50; 1000 lb or more, 114.00.

Zinc: Balls, 18.59; flat tops, 18.25; flats, 22.75; ovals, 22.00, ton lots.

CHEMICALS

Cadmium Oxide: $1.70 per lb, in 100-lb drums. **Chromic Acid:** 100 lb, 33.30; 500 lb, 32.80; 2000 lb, 32.15; 5000 lb, 31.80; 10,000 lb, 31.30, f.o.b. Detroit.

Copper Cyanide: 100-1000 lb, 77.50.

Copper Sulphate: 100 lb, 24.35; 200 lb, 21.35; 300 lb, 20.35; 400 lb, 19.85; 500 lb, 18.35; 2000 lb, 16.10; 6000 lb, 15.85; 12,000 lb, 15.60, f.o.b. shipping point.

Nickel Chloride: 100 lb, 48.50; 200 lb, 46.50; 300 lb, 45.50; 400 lb, 43.50; 5000 lb, 41.50; 10,000 lb, 40.50.

Nickel Sulphate: 100 lb, 40.50; 200 lb, 38.50; 300 lb, 37.50; 400 lb, 35.50; 5000 lb, 33.50; 20,000 lb, 33.00; 36,000 lb, 32.50.

Sodium Cyanide: 100 lb, 27.50; 200 lb, 25.80; 400 lb, 22.80; 1000 lb, 21.80, f.o.b. Detroit. **Sodium Stannate:** Less than 100 lb, 77.40; 100-600 lb, 68.20; 700-1900 lb, 65.50; 2000-9900 lb, 63.60; 10,000 lb or more, 62.30.

Stannous Chloride (anhydrous): Less than 25 lb, 167.10; 25 lb, 132.10; 100 lb, 117.10; 400 lb, 114.70; 5200-19,600 lb, 102.50; 20,000 lb or more, 90.30.

Stannous Sulphate: Less than 50 lb, 129.80; 50 lb, 99.80; 100-1900 lb, 97.80; 2000 lb or more, 95.80.

Zinc Cyanide: Under 1000 lb, 55.55; 1000 lb and over, 53.55.

(*Concluded from page* 163)

Pittsburgh—Prices are firming on broker buying. There are no major mill purchases. Most leading grades are stronger. No. 1 heavy melting and other major grades are up $1. Cast iron grades also are stronger. No. 1 cupola sold for $47, an increase of $2. Railroad grades are up $1. Machine shop turnings and cut structurals are quiet.

Cleveland — There's not much change in scrap market conditions in this area. Except for tonnage moving on old contracts, activity is limited. Recently the undertone has been slightly firmer, reflecting stronger markets at other points. Buying for local consumption is limited. The district ingot rate continues to decline. Last week it went down 3 points to 80 per cent of rated capacity.

Birmingham—Little success on on the part of a steelmaker in buying a large tonnage of bundles for an electric furnace at $50 a ton (up $3.50 from the previous quotation), emphasized the tight scrap supply here last week. Scrap is not coming into dealers' yards even at the higher prices offered. Brokers are paying $3 and $4 a ton premium for No. 2 heavy melting steel required on an old order. The cast iron market is firmer.

San Francisco — Steel scrap prices are holding in this market. But there is a feeling among dealers they may go lower shortly.

Los Angeles—Dealers report a slight firming in the scrap market here. They are cautions in predicting that consumers will increase their purchases noticeably over coming weeks. The larger buyers are still reducing inventories.

Vancouver, B. C.—Scrap prices in British Columbia are about on a par with those in the Seattle market. Exports from the area

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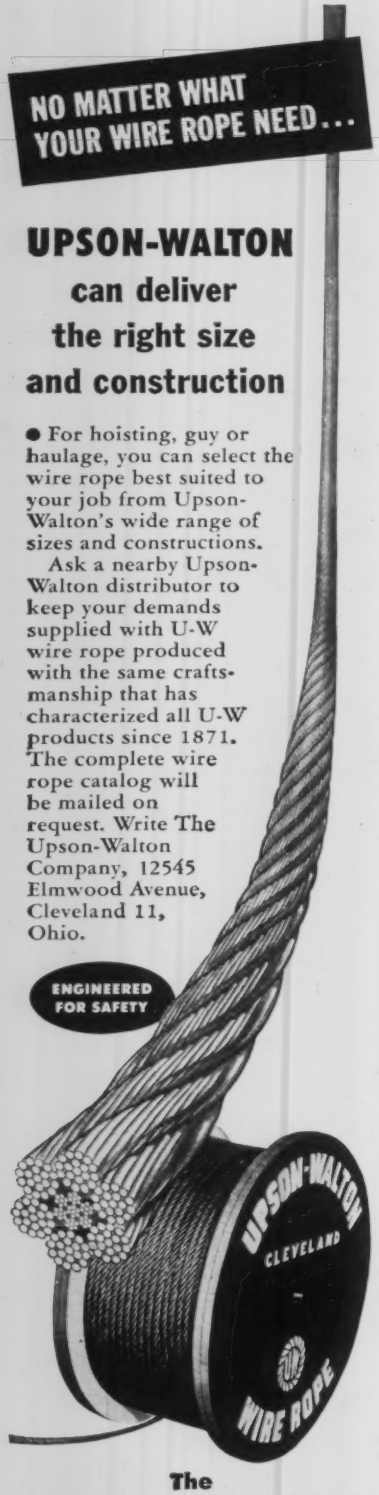

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Pig Iron . . .

Pig Iron Prices, Page 156

Foundry activities are spotty with many shops working less than the normal 5-day week. As a result, pig iron shipments in May will be below April's. Mass vacations and hot weather will make a big dent in foundry operations in July.

The outlook for June is uncertain. Prospect of higher prices in July may stimulate placing of orders for June delivery. Consumers are not showing much concern on that score. Even should there be an advance in pig iron prices, following a probable increase in finished steel products, there may be a lag in action by blast furnace operators, especially if business this summer doesn't improve more than now indicated.

Supply of iron is plentiful. Were it not for substantial purchases by Japan during recent months, stocks at the furnaces would be much heavier. The latest reported purchase by Japan involved 10,000 tons of basic iron. It will be supplied by a Buffalo furnace.

Pig iron stocks are building up rapidly at Buffalo steel mills because they are not consuming as much hot metal in their reduced open-hearth operations.

Blast Furnace Sets Record

HAZEL FURNACE at U.S. Steel Corp.'s Fairless Works, Morrisville, Pa., has established a new world record in blast furnace production.

Output in April (a 30-day month) was 62,370 tons, shattering the previous record of 61,803 tons set by the same furnace in October, 1955 (a 31-day month).

World record prior to Hazel's performance was held by Bethlehem Steel Co.'s "J" stack at Sparrows Point, Md. This stack produced 61,424 tons in May, 1954.

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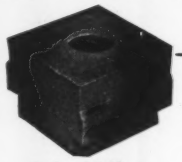

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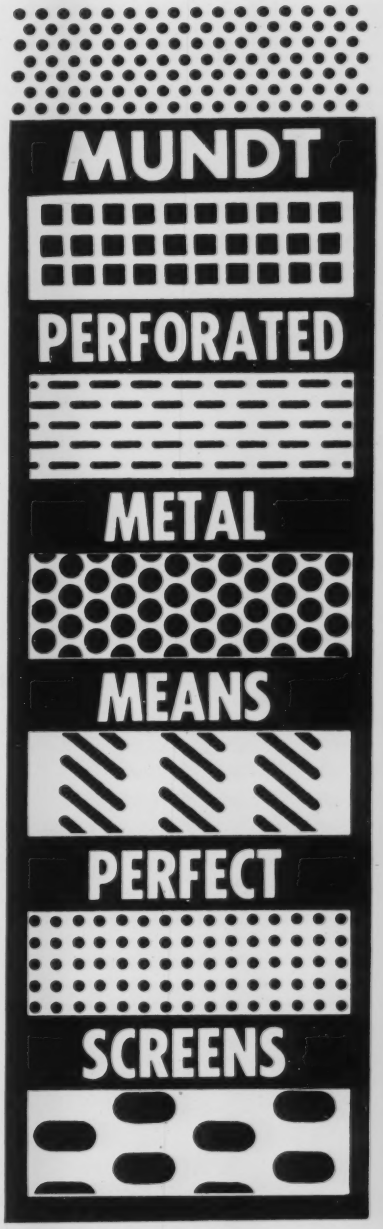

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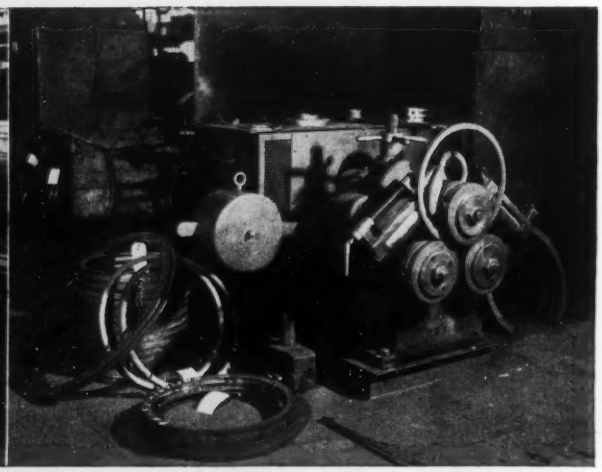

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Steel warehouses have brought in profitable, new fabrication business by purchasing a Bending Roll. A mower manufacturer adapted his roll to apply the twist to his reel blades. Many firms use special rolls for 1001 highly specialized operations. All agree on the exclusive "Q" Factor* features of rigid, lasting construction, easy roll changes and diameter adjustments, simple operation requiring no highly skilled personnel — and no expensive die requirements.

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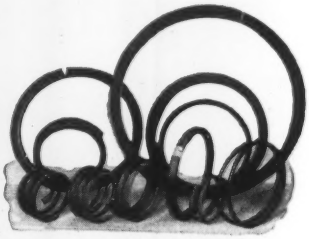

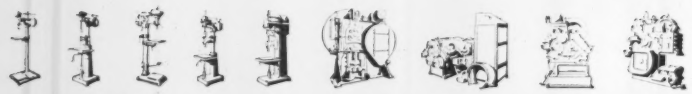

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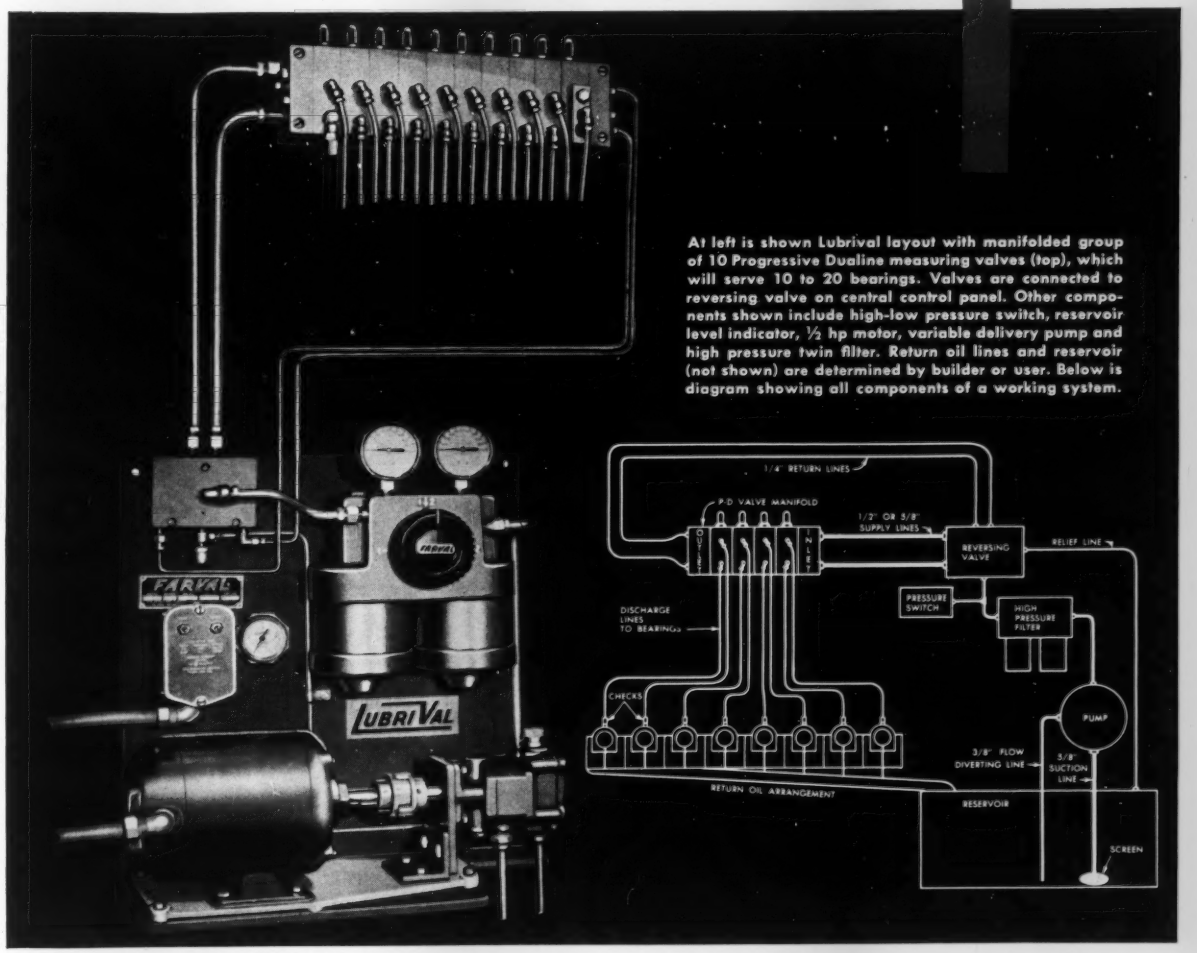

At left is shown Lubrival layout with manifolded group of 10 Progressive Dualine measuring valves (top), which will serve 10 to 20 bearings. Valves are connected to reversing valve on central control panel. Other components shown include high-low pressure switch, reservoir level indicator, ½ hp motor, variable delivery pump and high pressure twin filter. Return oil lines and reservoir (not shown) are determined by builder or user. Below is diagram showing all components of a working system.

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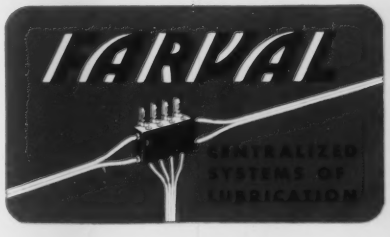

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